

U.S. EPA- Sponsored Workshop








Securing Financing for Coal Mine

Methane Emissions Reduction

7 May 2003

This document contains the slides that were used in presentations given at the workshop. The *slide* following this one, lists the authors, their affiliations, and the titles of their presentations. It contains active *links* to the first slide of each presentation. To follow the link click on the *title* of the presentation. Press the *home* key on your keyboard to return to this slide.

Links to Presentations

Affiliation	Presenter	Title
	Karl Schultz, Team Leader Clark Talkington	Introduction to Workshop on Securing Financing for Coal Mine Methane Emissions Reduction
 NATSOURCE	Neil Cohn, Senior Director	GHG Market 2003 Update and Strategic Review
 	Justin Guest, Michael Coté, Project Engineer	Coal Mine Methane Utilization Projects: Reducing Greenhouse Gas Emissions in the Coal Sector
	Dr. Mark C. Trexler, President	The Buyers in the GHG Mitigation Market
 NATSOURCE	Neil Cohn, Senior Director	GHG Contract Structuring the Transaction
	Dr. Mark C. Trexler, President	A CMM Case Study

U.S. EPA- Sponsored Workshop

Securing Financing for Coal Mine Methane Emissions Reduction

2003 International Coalbed Methane Symposium

7 May 2003

Tuscaloosa, Alabama USA



**RAVEN RIDGE RESOURCES
INCORPORATED**



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Coalbed Methane Outreach Program

EPA's Coalbed Methane Program

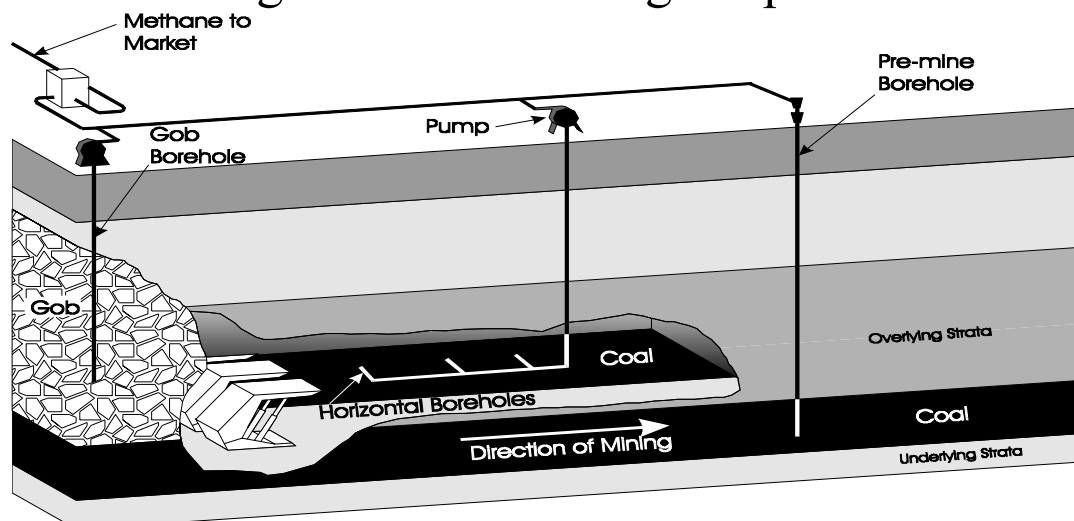
- Voluntary program established in 1994 to reduce Coal Mine Methane emissions
- Domestic and international programs
- How We Work
 - Identify profitable opportunities for CMM recovery
 - Generate project development support
 - Provide technical assistance
 - Help overcome market, regulatory, and technical barriers
 - Publish & distribute technical and market analyses

Coalbed Methane Outreach Program

What is Coalbed Methane (CBM)?

What is Coal Mine Methane (CMM)?

- Coalbed Methane (CBM):
 - Natural gas from coal seams.
- Coal Mine Methane (CMM):
 - A subset of CBM; methane gas released from coal or surrounding rock strata during the process of coal mining.



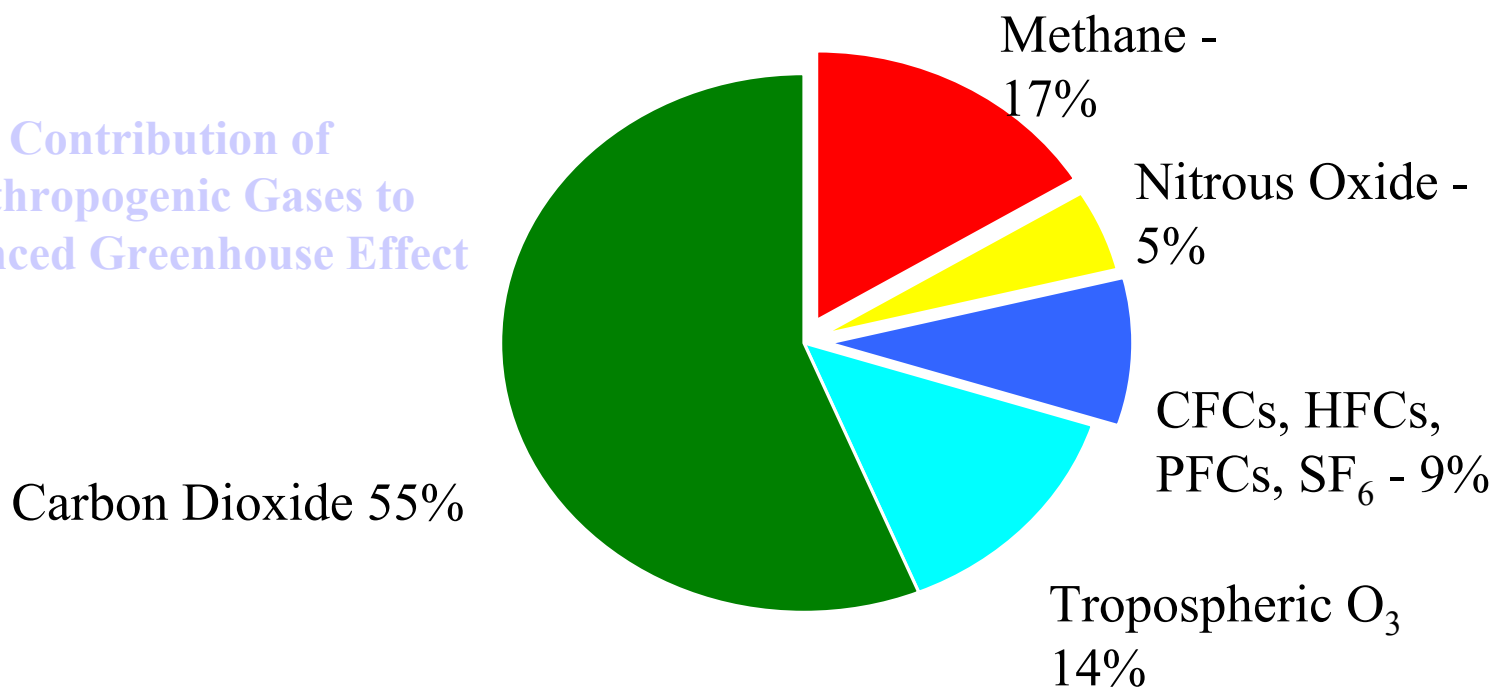


Coalbed Methane Outreach Program

Methane is a Potent Greenhouse Gas

- 21 Times More Potent Than Carbon Dioxide
- 2nd Only to Carbon Dioxide as a Contributor to Global Warming

Contribution of
Anthropogenic Gases to
Enhanced Greenhouse Effect



Source: IPCC, 1996.

Total = 2.85 Watts/m²



Coalbed Methane Outreach Program

Tremendous Potential for CMM Emission Reduction

- One CMM Project At One Mine May:
 - Reduce emissions by 100,000 - 1,000,000+ tons/year CO₂ equivalent
- Often Straightforward to Quantify, Verify Emission Reductions
- Significant Global Potential:
 - Total global emissions: 475 - 750 million tons CO₂ Equivalent/Year
 - Short-term reductions: 85 - 150 million tons/year
 - Longer-term reductions: 150 - 300 million tons/year



Coalbed Methane Outreach Program

Global CMM Emissions

*Does Not Include Abandoned Mine Emissions

Country	2000 CH ₄ Liberated (Mln m ³)	2000 CO ₂ Equivalent (MMT)	2010 CH ₄ Liberated (Mln m ³)	2010 CO ₂ Equivalent (MMT)
China	10,000	142.7	15,753	224.7
US	5,461	77.9	5,748	82.0
Russia	2,236	31.9	2,138	30.5
Australia	1,381	19.7	2,004	28.6
Ukraine	1,970	28.1	1,689	24.1
India	683	9.7	1,319	18.8
Poland	1,037	14.8	939	13.4
Germany	1,030	14.7	764	10.9
South Africa	496	7.1	506	7.2
Kazakhstan	488	7.0	447	6.4
United Kingdom	365	5.2	343	4.9
Czech Republic	351	5.0	266	3.8
Turkey	123	1.8	184	2.6
Japan	133	1.9	147	2.1
Canada	98	1.4	91	1.3



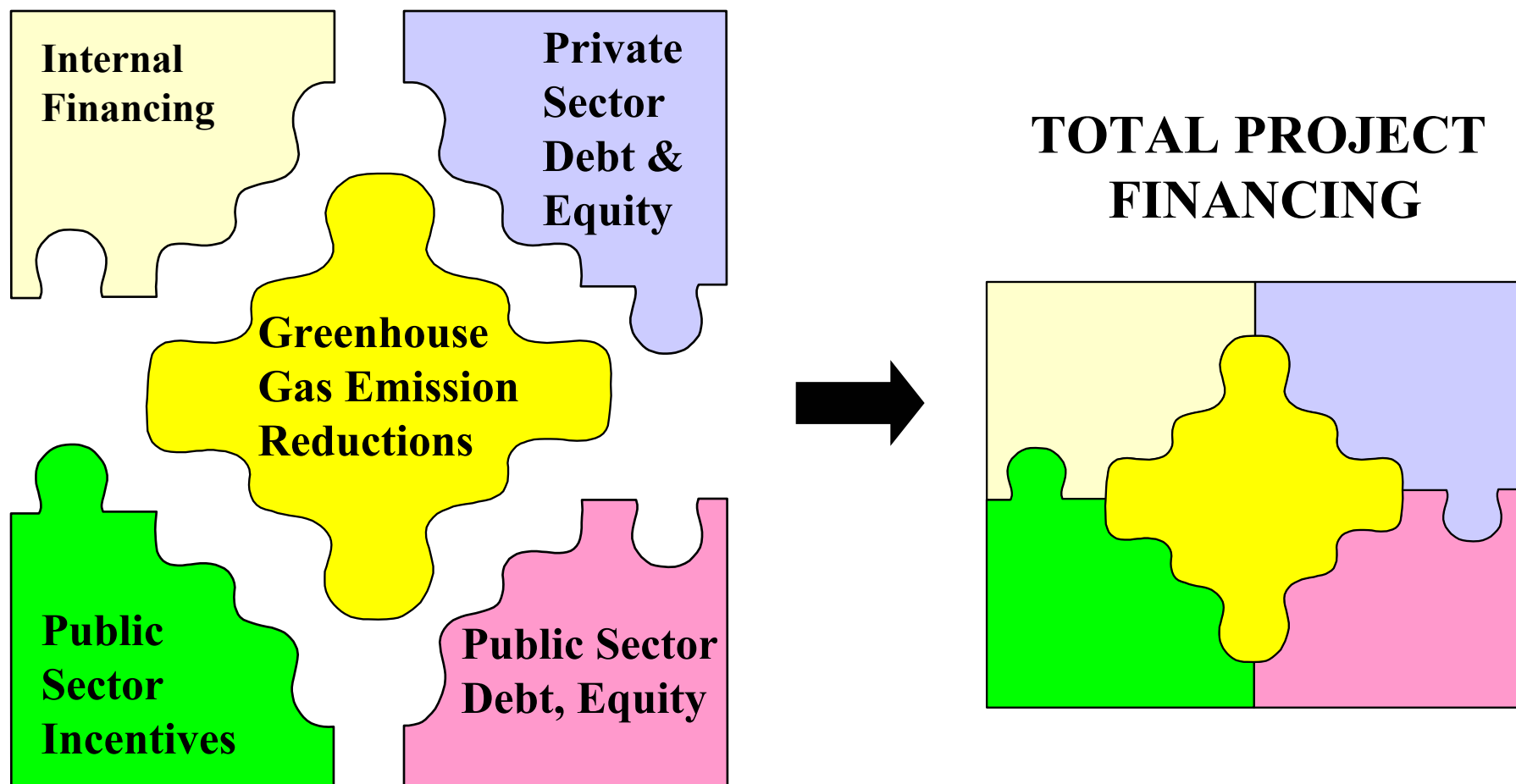
Coalbed Methane Outreach Program

Common Challenges Facing International CMM Projects

- Technological Barriers - Need modern equipment and training
 - Institutional Barriers - CMM is a resource, not a useless byproduct and safety hazard.
 - Legal Barriers - Ownership and lack of transparent legal systems
 - Economic Barriers - Project Finance, Sometimes Low Energy Prices
-

Coalbed Methane Outreach Program

Project Funding from Many Sources





Coalbed Methane Outreach Program



Finding Value in GHG Emission Reductions

- Methane mitigation - increasing prominence as an effective option for climate change policy
 - Methane is a commodity that has value beyond the emission reduction
 - Hansen, Pew Center, MIT and others - a strategy focusing on non-CO₂ GHG emissions could reduce the rate of global warming at lower cost
-



Coalbed Methane Outreach Program



GHG Markets

- Private Sector-, Multi-lateral-, and Government-sponsored markets exist
 - Transactions occurring
 - CMM projects are considered high-quality reductions
 - Potency of methane
 - Easier to quantify and verify the emission reduction
 - CMM emission reductions can be bundled with coal and natural gas sales
-



Coalbed Methane Outreach Program



Quantifying CMM Emission Reductions

- Establish the project baseline to determine business-as-usual emissions
 - Establish protocol for monitoring, measurement, and verification
 - Monitor emissions according to protocol
 - Measure emissions and compare against the baseline to determine reductions
 - Independent 3rd party verification
-



Coalbed Methane Outreach Program



CMM Financing Workshop

- Provide overview of the carbon market and emissions trading
 - Introduce concepts of baseline setting, and monitoring, measurement, and verification of emission reductions
 - Springboard for industry-led discussions on protocols for quantifying and verifying emission reductions from CMM projects
 - Continue forum for discussion at future events
-



Coalbed Methane Outreach Program

CMM Financing Workshop Schedule

1:15-1:45	Overview of the Emerging Carbon Market Natsource
1:45-2:00	Discussion
2:00-3:00	CMM Project Design and Implementation Raven Ridge Resources & EcoSecurities
3:00-3:25	Break
3:25-3:40	Discussion
3:40-4:10	Marketing the Project Trexler & Associates and Natsource
4:10-5:00	Wrap-up: Panel Discussion
5:00-7:00	Reception



Coalbed Methane Outreach Program



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GHG Market 2003 Update and Strategic Review

Tuscaloosa, Alabama
Neil Cohn, Senior Director

May 7th, 2003



N A T S O U R C E

The Carbon Market Emerges



Emissions Trading Rationale

- Harness market forces to achieve most cost-effective reductions
- Benefits: lower aggregate costs
 - lower individual costs
 - incentive to innovate

“Maximum Environmental Results
at Minimum Cost”



Emissions Trading Yields Results

- SO2 Trading:
 - IV of the Clean Air Act set goal of reducing SO₂ emissions from electric utilities by 10 million tons by 2010 compared to 1980 levels
 - Cap and Trade program:
 - Sets mandatory cap on emissions. Divides cap into allowances. Distributes based on historical energy consumption. Allows trading
- ➔ **Result – 100% Compliance**
- SO2 trading dramatically exceeded targets at 22% of the cost.
 - Greenhouse Gas (GHG) emissions trading makes sense
 - GHG reduced at a Shaanxi coal mine, Alberta Power plant or a Pennsylvania coal mine have the same effect on climate change
 - By finding the lowest cost solutions incentives are created for innovation in order to mitigate the global effects of climate change.



Kyoto's GHG Market Is Evolving

Canada:

Ratified Kyoto Protocol;
Trading system under development; Provincial GHG requirements implemented

Japan:

Ratified Kyoto Protocol;
GHG trading simulations in 2002;
Implementation of domestic measures

European Union:

Ratified Kyoto Protocol;
GHG trading system operational in 2005

Other EU Countries:

Planning to implement domestic trading programs in 2005 to conform to EU plan

Sweden and Norway :

Issued tenders for CDM and JI projects

Austria:

Plans to issue tender worth 36 million EUR for CDM and JI projects

Finland:

Tender for small-scale CDM project issued;
Expected to yield 500,000 Mt CO₂e

Denmark:

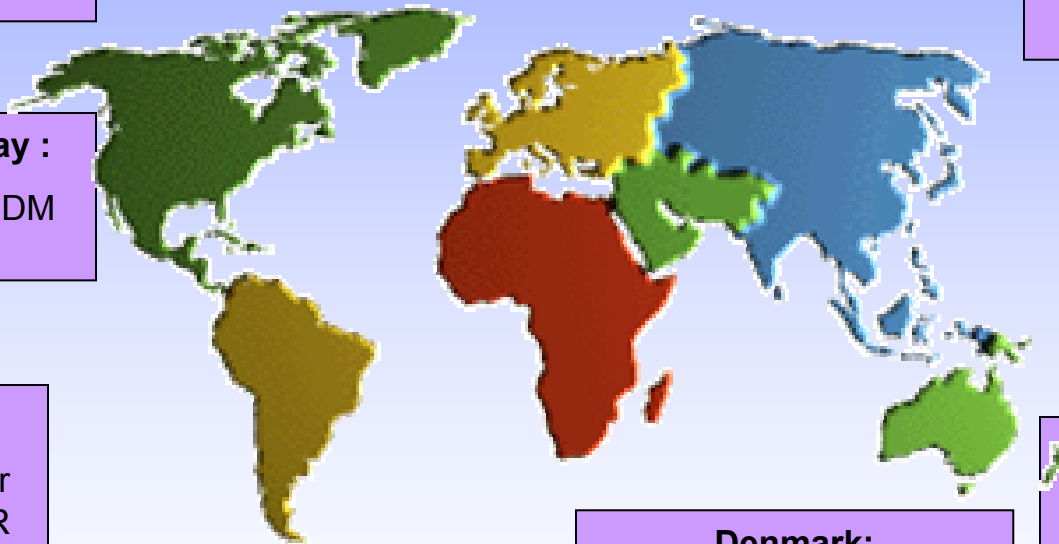
GHG cap in power sector, 2001-2003;
Purchased ERUs from Romania in March 2003

United Kingdom:

500 trades under UK Emissions Trading Scheme involving 1.6 to 1.7 million allowances

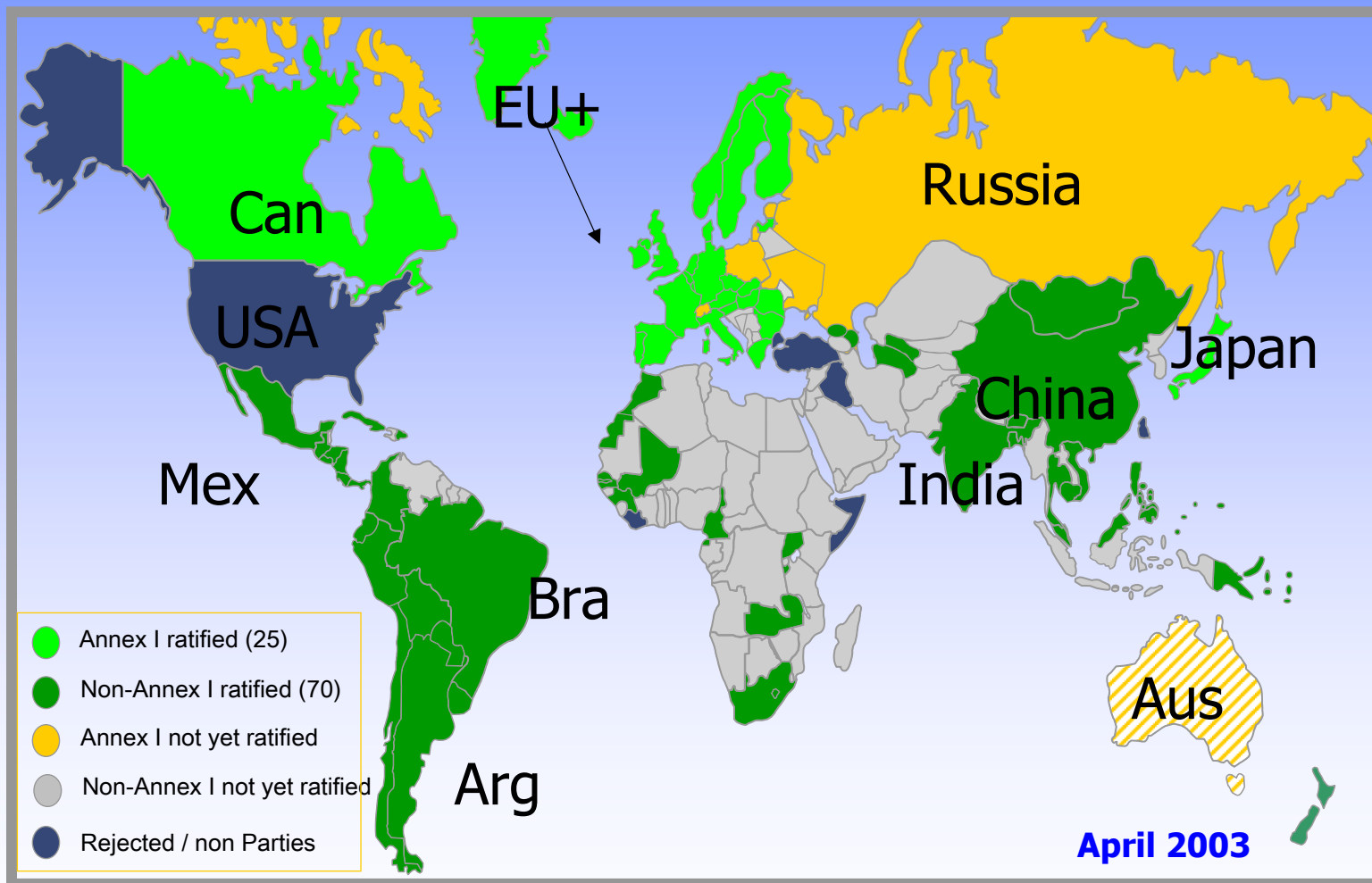
Netherlands:

Purchased 25.2 million GHG reductions for \$138 million from ERUPT and CERUPT; 1 more ERUPT issued;
Transactions outside tender process executed



Kyoto's World

Greenhouse Gas



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Kyoto vs. Non-Kyoto Markets



Current U.S. Policy

President's Global Climate Change Initiative

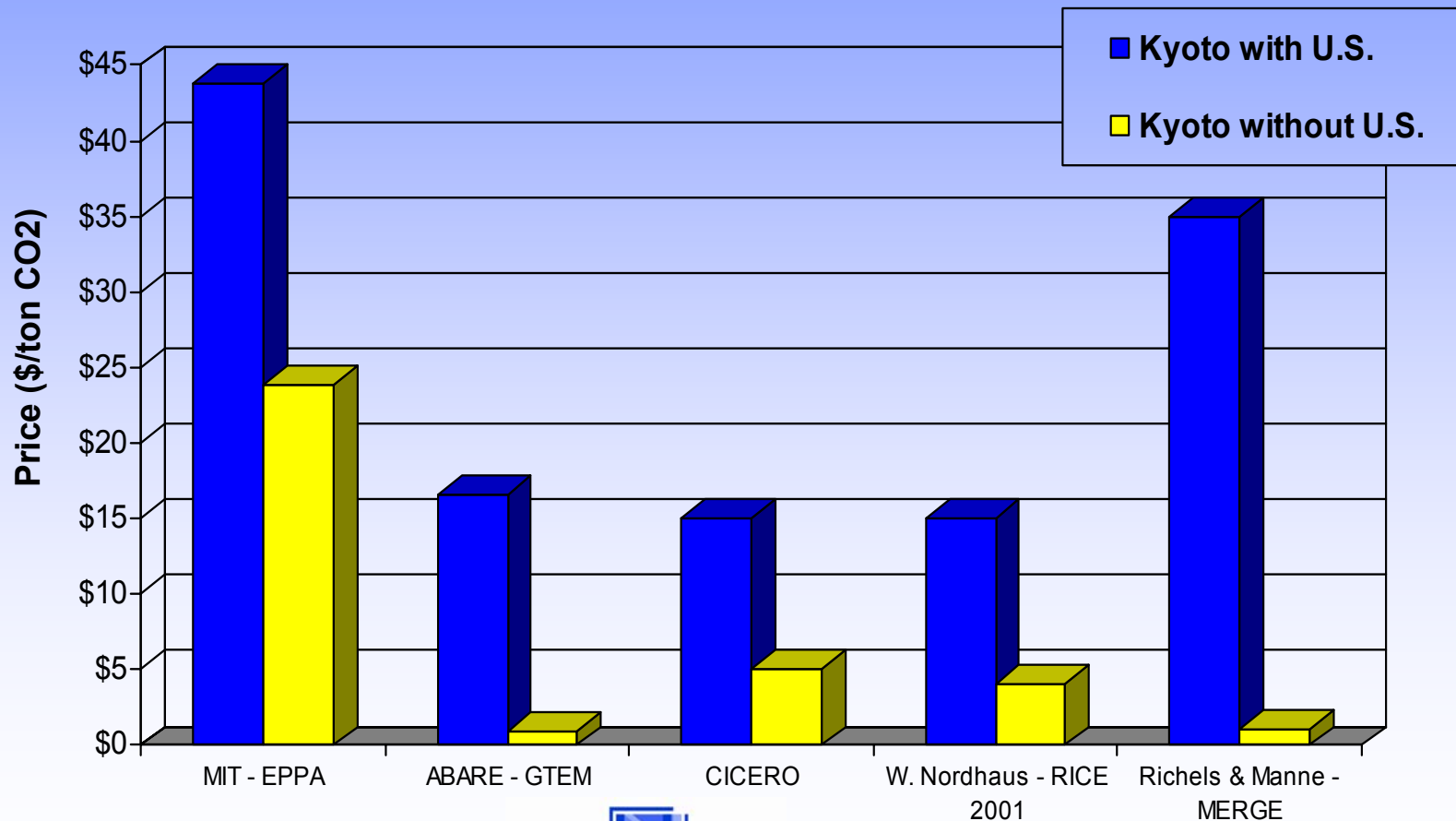
- Goal is to reduce U.S. GHG intensity 18% by 2012
 - Emissions reduced 4.5% relative to business-as-usual in 2012
- Improve voluntary national emissions registry
- Provide baseline protection and give “transferable credits” for “real” reductions (May require legislation)
- Further measures if 2012 goal will not be met
- Programs lacks mandatory measures
- Policy may change if US faces trade difficulties or sanctions

Ongoing Action

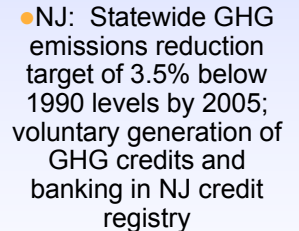
- Effort underway to improve reporting and industry commitment
- Senator Jeffords' four-pollutant bill passed Committee
- Voluntary GHG reporting
- Federal RPS in energy bill conference
- Tax credits for renewable energy and stranded



Supply & Demand of Kyoto: CO2 Price Projections with & without the U.S.



Other US federal environmental laws started this way



Scenarios for U.S. Participation

1. U.S. does not develop domestic program or participate in international system
 - Near-term advantage, long-term uncertainty
 - Compliance costs for ratifying parties remain low
 - Possibility for sanctions or
2. U.S. develops domestic system, stays outside of international system
 - Key is whether U.S. firms gain access to international instruments
 - Environmental, trade and political issues are key
 - Markets likely to converge, but with higher costs
3. U.S. develops domestic system and joins international system in 2nd commitment period
 - U.S. will have to conform program or develop implementing legislation
 - U.S. firms will have to live with rules developed by others
 - Compliance costs will likely increase



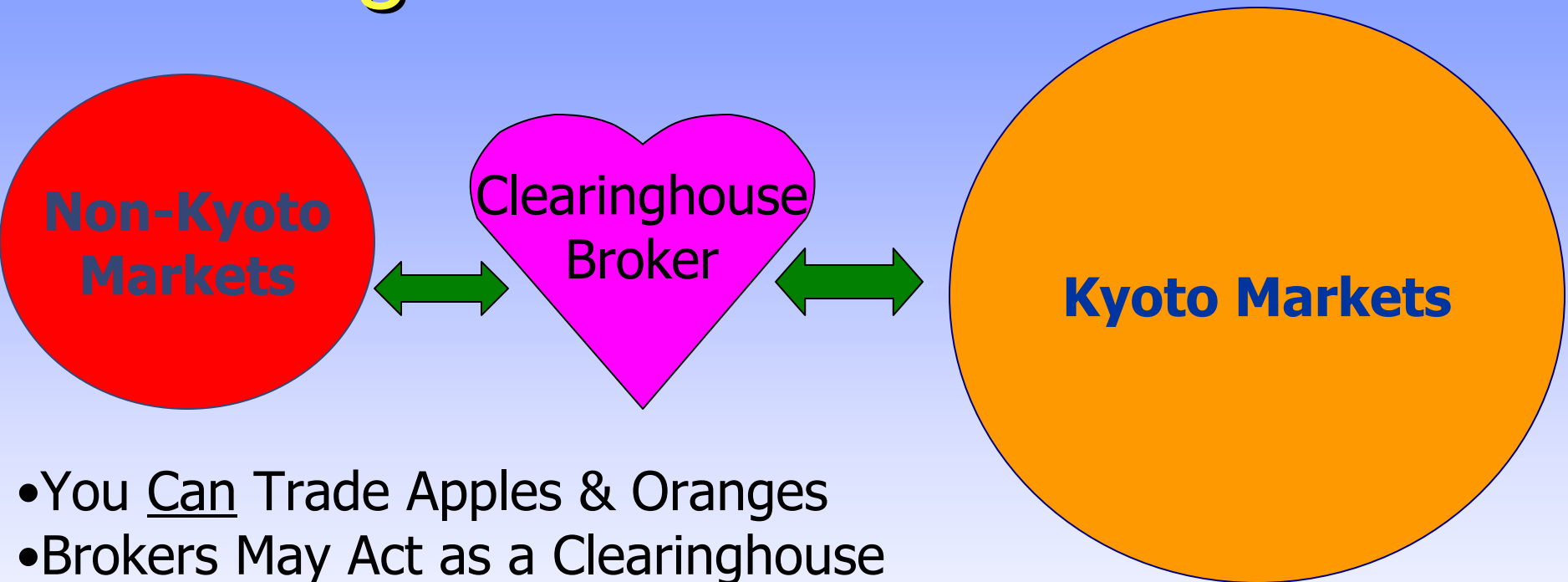
Fragmentation: Impact of Ongoing Policy Development

- System designs are different (UK, DK, EU...Canada, US?)
 - Voluntary vs. mandatory programs
 - Different gases and sectors are covered
 - Different compliance programs
- No rules for interchange or recognition yet among operational systems
- Fragmentation and complexity can result in increased costs and reduced performance
 - Such as US OTC NOx trading
- Systems can and should be linked earlier than later to avoid inefficiencies
- Markets will address - at a cost



Example: Market Solution

Fragmented Markets Trade



- You Can Trade Apples & Oranges
- Brokers May Act as a Clearinghouse Between Various Compliance Regimes
- Weaker systems will be discounted
- UK and Dutch allowances have already been swapped

CDM as the Universal Kyoto & Non-Kyoto GHG Instrument?

- US Buyers prefer GHG that has a proxy value in Kyoto markets
- USA initiated Kyoto trading flexibility
 - Any potential US program likely to include Developing Country Project (DCP) similar to CDM
- All 3US Bilateral GHG Agreements (Canada, Japan & Australia) stress aiding clean developing country investment
- CDM, or it's non-Kyoto equivalent, could act as a common “swing” instrument which could provide compliance value in Kyoto and non-Kyoto markets.



CDM is the Current Focus

- CDM is the first Kyoto compliance and may have value in many GHG markets
- Latin America has created the infrastructure to gain the advantage as the key source of CDM supply
- Many landfill gas projects (LFG) projects as they have been the easiest to develop at current price levels
- Multi-lateral buying programs (PCF, IFC, CAF) have disproportionate quantities of both LFG and Latin projects and are looking to diversify (SARs further affecting Asian Supply)
- EU rules and Multi-lateral program parameters will greatly affect current CER pricing (low demand for post-2012)
- Prices of CER candidate emission reductions are ranging from \$2 to \$6 per CER (1 metric ton of CO₂ equivalent)
 - Value affected by credit, guarantees, location, technology etc.
- UNFCCC CDM Executive Board estimates 200 projects will seek approval in 2003



Clean Development Mechanism (CDM) Creating Credits through the Intl. System:

- CDM allows for credit creation (CERs) from projects in developing countries under Article 12 of the Kyoto Protocol
- Developing countries identify domestic sustainable development practices and determine project appropriateness
- CDM process through UNFCCC:
 - Submit Project Design Document (PDD)
 - Baseline validated by Designated Operational Entity (DOE)
 - Project performance validated by DOE
 - Registration of project with CDM Executive Board
 - CERs issued by CDM Executive Board



Institutional Carbon Funds & National Buying Programs



Multi-Investor Institutional Carbon Funds

- World Bank Funds
 - WB Prototype Carbon Fund (PCF)
 - US\$180million, Currently paying US\$3 - \$4 dollars per ton CO₂e upon delivery
 - 6 Governments: 17 Private Sector companies
 - WB Community Development Carbon Fund (CDCF)
 - Smaller projects with greater sustainable development factors
 - US\$ 40 million first close. Will pay \$4 to \$6 per ton
 - WB BioCarbon Fund is planned
- EBRD/Fondelec US\$70 million
- REEF/IFC Fund US\$200 million
- UBS Alternative Climate US\$60 million (failed)
- Austrian Carbon Fund: €360 million over 10 years (2003-2012)



Dutch Government

Funds & Tenders

- Initial US\$250 mil. earmarked for investment
- 50% of national commitment:
100 million tonnes CO₂e (over 5 years)
- Funds via Banks
 - World Bank's Netherlands CD Facility €140 mil.
 - IFC-NL Carbon Facility €44 million
 - CAF-Netherlands CDM Facility US\$40 million
 - Rabobank Netherlands Carbon Facility
- Global Tenders:
 - ERUPT: JI 3 rounds 40+mtCO₂e @ €5 - € 9
 - CERUPT: CDM 1 round 16 mtCO₂e @ €3 - € 5



The National and Sub-National Markets



Danish Market

The first national compliance market.

Greenhouse Gas

- Power sector cap; expires in 2003; possible extension until 2004 and modification in 2005 to adapt to EU-wide system
- Over 20 transactions recorded for
 - Natsource brokered first transaction in Danish allowances between Entergy and Elsam
 - Trades & swaps total estimated volume of 460,000
 - Typical size: 5000-15000 tCO₂e
 - Price: US \$2-4.60 tCO₂e
 - Immediate settlement; mainly current vintage
- Non-compliance penalty: \$5-6/tCO₂e acts as price cap Initial cap on CO₂ of 23 million tons in 2000 is reduced 1 million tons per year through 2003



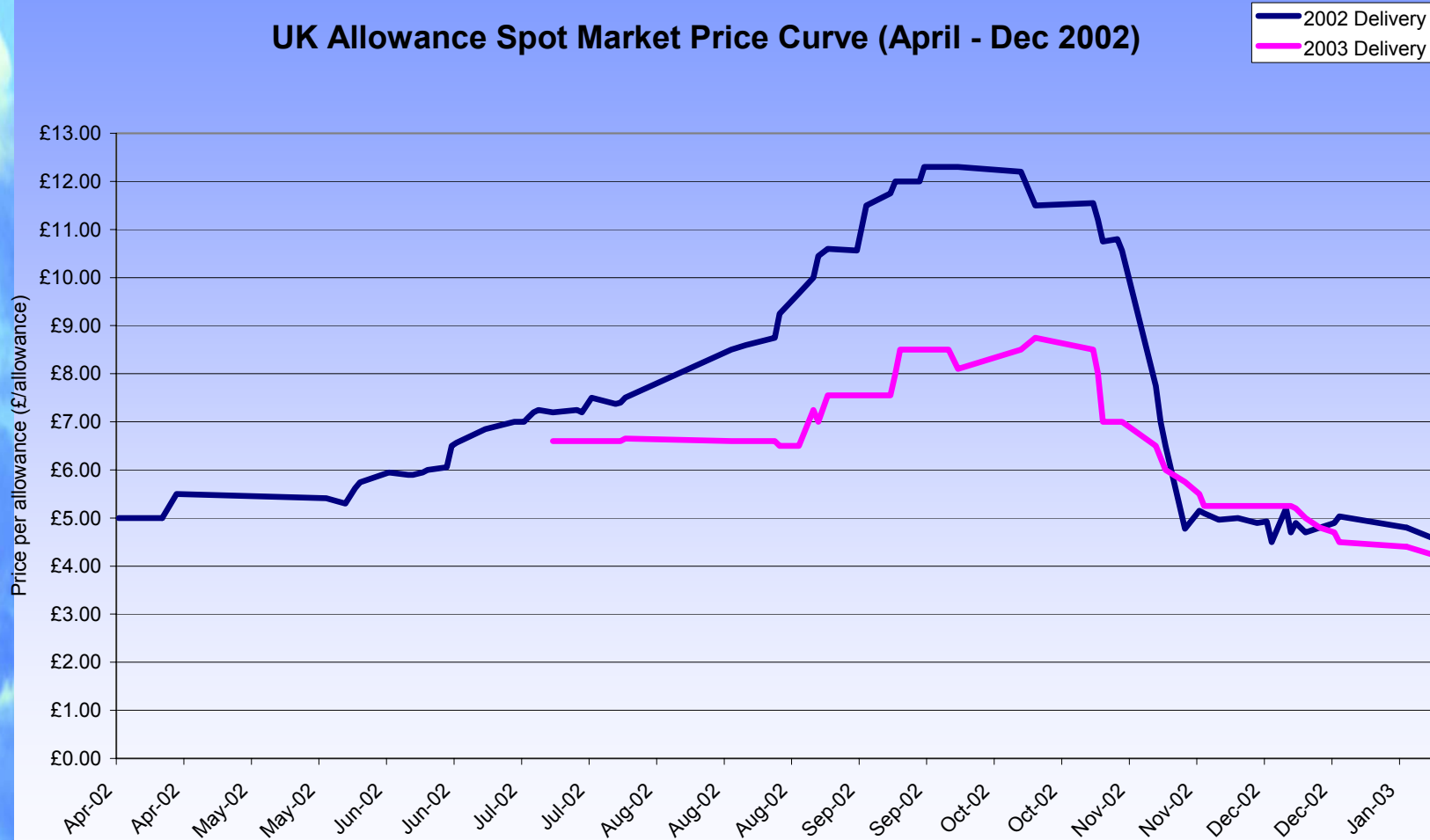
UK Emissions Trading Scheme (ETS)

- A voluntary, scheme running for 5 years. Covers all 6 classes of greenhouse gas. Covers downstream energy consumption.
- Direct Entry Participants: Reverse auction held in 03/2002. 34 companies accepted absolute targets of 4 mtCO₂e reductions in exchange for \$17/tCO₂e
- Climate Change Agreement (CCA) Participants: All Companies who have entered into CCA with the Government can trade to meet their targets or sell allowances generated by exceeding their targets.
- Projects can earn credits for facilities not covered by a CCA or under the direct entry scheme.
- Over 500 trades for approximately 1.9 million allowances.
- Natsource brokered first transaction in UK allowances between DuPont and Mico; first trade in compliance instruments
- Prices ranged from
- Early trading ranged £6- £8. Market traded as high as £12.40 (Sept 02). Current lull in the market with prices at only ~£3 due to biannual CCA targets. (Next CCA true-up Feb 2005)



UK Prices

UK Allowance Spot Market Price Curve (April - Dec 2002)



EU-Wide Emissions Trading

- **Key features:** Mandatory, Absolute target, % not finalized
 - CO2 only 2005-2007. All 6 KP gasses 2008-2012.
 - Trading system likely to cover about ½ of EU emissions.
 - Trading to cover Industrial & energy sectors; not chem /alum
 - Allocation by grandfathering 2005; perhaps up to ¼ auctioned
 - CDM/JI project eligibility to be decided this month
 - Since CO2 only, will methane projects be excluded?
 - “Priority will be given to domestic actions”
 - National allocation plans must be presented in March 2004; trading to begin in 2005
 - Other **EU countries** waiting for finalized EU system rules before implementing domestic trading systems
- EU obligations start in 2005 but they have already traded
 - Shell (UK) contracted for EU Allowances from Nuon (NL)



Japanese Market

- Cap and Trade is viewed as potentially injuring Japans competitiveness
- Japan has established guidelines for CDM / JI investment
- Japan is currently developing registry and trade simulations
- METI has announced there will be no “Dutch Style” buying program. Rather Japanese companies are encouraged to invest in or buy credits from CDM / JI with a hint of future government subsidizes



Canadian Market

- Industry Covenant process in progress
 - 9 Sectors covering 670 companies
 - 55 million tons to be reduced per year by 2010
 - To be finalized by 1st quarter 2004 and implemented by 2005
 - Shall decide Allocation, Penalties, Domestic offset & early action crediting, Monitoring & verification
- Define mechanism for Canada's \$15 cap
- Most active market has gone silent while finalizing allocation & other program details



Sub-national Markets

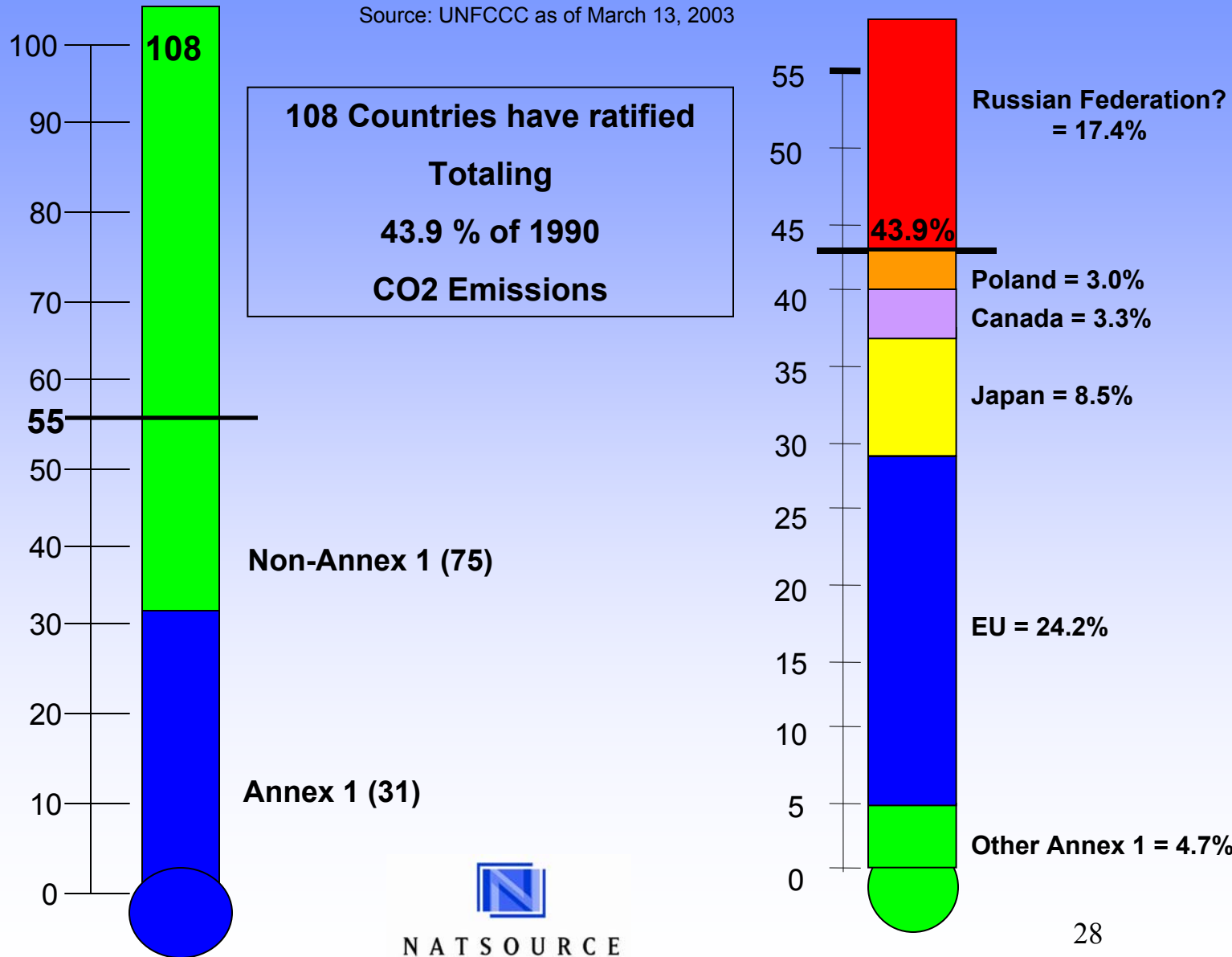
- **Implemented on Power sectors**
 - **Oregon**, CO2 Law (Over \$5 million in GHG already)
 - **New South Wales, Australia**, Affects Electricity retailers
 - **New Hampshire** will require fossil fuel plants to reduce CO2 emissions.
 - **Massachusetts**, 6 fossil-fueled power plants will be required to meet GHG standards. Rules are under development but a few trades have occurred.
 - **California** bill was passed regulating greenhouse gas emissions from automobiles, SUVs and light trucks.
 - **NY**, Governor Pataki's Northeast GHG Utility Trading program?



Russia Must Ratify for Entry into Force

55 Parties Need to Ratify Representing 55% of Annex I Parties' 1990 CO₂ Emissions

Source: UNFCCC as of March 13, 2003



Waiting on Russia

The swing vote from the biggest long

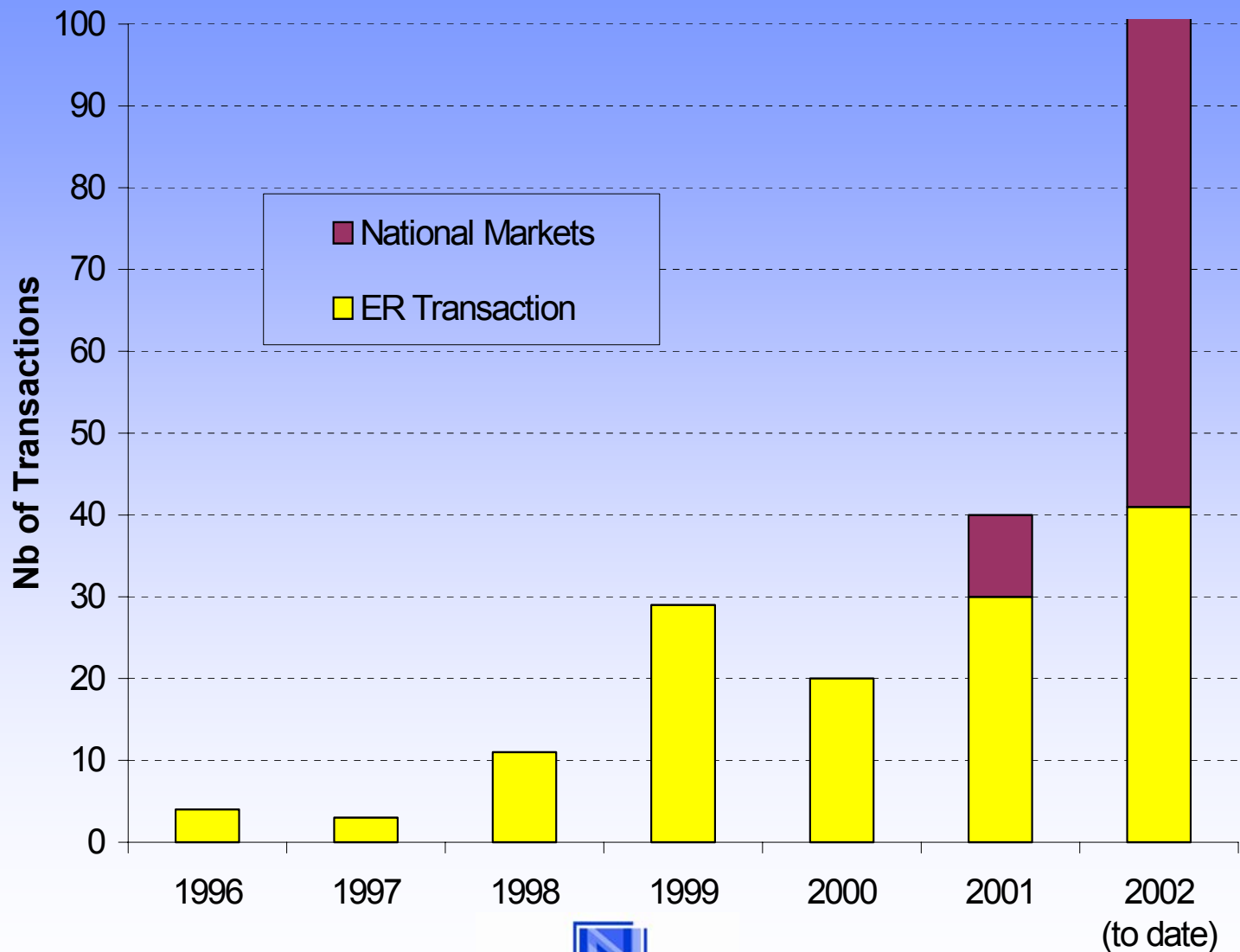
- Political will is questionable
 - No National authority, registry, bilateral MOUs
- Outside pressure from Japan, NATO and the US will be a factors
- If Russia drops KP, market could 1) stutter 2)carry on, or 3) fall apart
- Internal pressure from oil & gas industry to ratify and benefit from surplus
 - Financial benefits are too great to ignore



Market Size and Timing



Number of trades 1996-2002

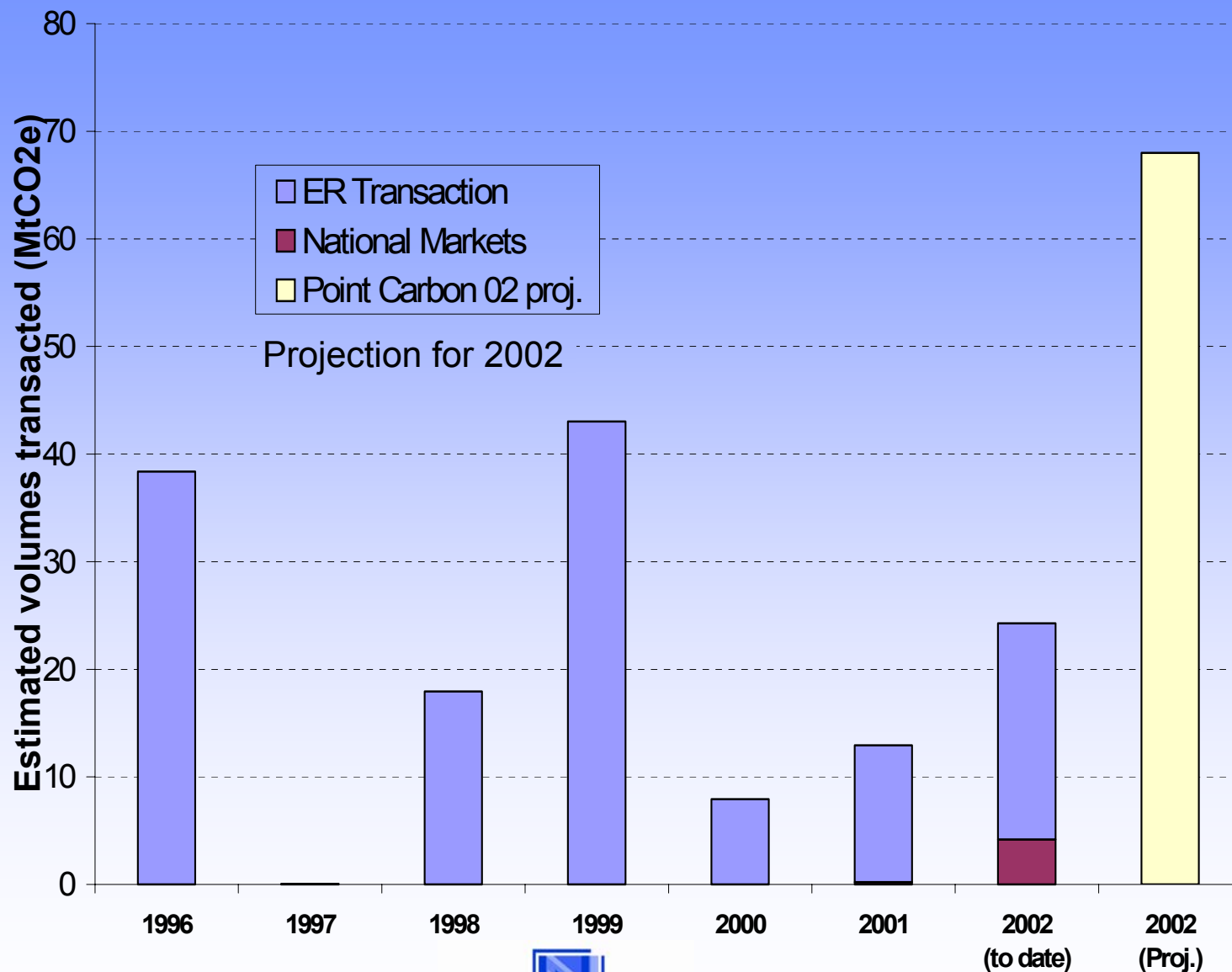


Source: based on World Bank Report



N A T S O U R C E

Volumes transacted 1996-2002



Source: based on World Bank Report



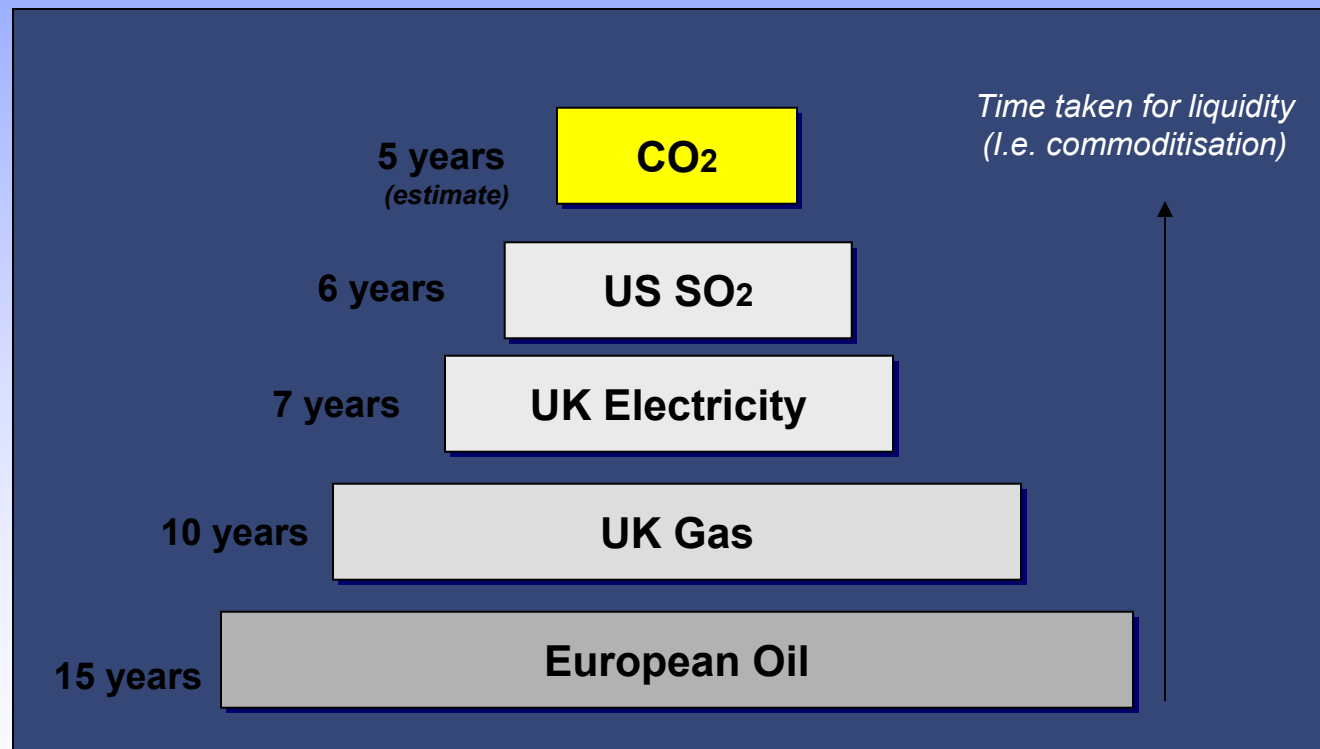
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How Big is it Now? Future?

- A recent World Bank Report estimates the total value of known transactions, including vintages up to 2012, to be about \$350m - \$500m
- Project-based ER purchases bulk of carbon market
 - 2/3 of transactions, but 97% of volume since 1996
 - Still 85% of volume in 2002
- Volumes transacted in 2002 are likely to be at least 4 times higher than volumes transacted in 2001. 2003 appears be more active yet.
- The UK spot market may overtake the North American market in terms of number of trades executed. However, volumes remain small.
- Ratification of the KP could increase volume dramatically. Prices may not change.



Time to Commoditization?



Market Trends & Issues

- Landmark events are important but results are unpredictable
 - Canada Ratification – A bit of a bust Wait for covenants to be negotiated
 - Russia Ratification – KP into force but at what cost? Will the supply overwhelm the market?
 - EU Directive finalization- Will CDM/JI be included? If CO2 is out for first phase, will LFG CDM qualify?
- COP9 will give more clarity on Sequestration
- Market fragmentation with price distortions likely for foreseeable future. Transitions can be messy.
- Ratification will force Kyoto market convergence
- Responsibility is moving from Environmental departments to Energy Traders
 - Traders view GHG as an opportunity not cost



Current Market Pricing

GHG Prices by Commodity and Vintage (U.S.\$ per ton CO₂E)

Commodity Type	Vintage Year	Bid @ Ask Spread
Verified Emission Reductions ("VERs")		
USA VERs	2000-2018	\$0.50 @ \$1.00
CCX	2003-2006	\$0.30 @ \$2.25
Ratifying Annex B VERs	2000-2007	\$1.00 @ \$3.00
Ratifying Annex B VERs	2008-2012	\$1.50 @ \$3.00
CDM VERs	2000-2012	\$3.00 to \$7.50
Dutch ERUs	2008-2012	€4.5
World Bank PCF	2000 - 2012	\$3.00 to \$4.00
PCF Secondary Market	2000-2012	\$3.50 @ \$7.00
Compliance Tools		
UK allow ances - offer	2002	£3.00 @ £4.50
UK allow ances - offer	2003	£2.80 @ £3.00
EU Allow ances	2005 - 2007	€5.00 @ €8.00
AAUs	2008 - 2012	@ \$8.50



Micro Qualitative Price Determinants

- Likelihood that ER is certified under KP or other regime
- Creditworthiness of project sponsor and viability of project
- Confidence in the quality of the ongoing carbon asset management over life of project
- Structure of contract (e.g. spot vs. forward, upfront vs. payment on delivery)
- ER Vintage
- Cost of validation and potential certification
- Additional environmental and social benefits



Macro Market & Liquidity Drivers

- Russia's ratification and the Kyoto Protocol's entry into force.
- Emerging details of EU trading program
- Non-Kyoto (US) Political developments in regards to climate change and energy
- Japanese government guidance to corporations
- Additional national governments emerging as buyers
- Negotiations regarding Kyoto's 2nd compliance period from 2013 to 2017
 - This will affect ability for projects to be viable from a longer stream of marketable compliance



Natsource at a Glance

- Global Reach
 - New York, Washington, Ottawa, Calgary, London, Tokyo
 - 180 Employees
- Asset Management Firm
 - Environmental Commodities
- Major Environmental Commodities Manager
 - Large Broker of SO₂, NO_x
 - Voted Top GHG Broker
 - (*Environmental Finance Magazine Survey, 2000, 2001 & 2002*)
 - Voted Top RECs broker
 - (*Environmental Finance Magazine Survey, 2001 & 2002*)
- Large Energy Broker
 - One of Highest Volume Gas Brokers
 - Major Electricity Broker



Contact Natsource

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N A T S O U R C E

Coal Mine Methane Utilization Projects

Reducing Greenhouse Gas
Emissions in the Coal Sector
- Project Cycle -

presented by

Justin Guest

&

Michael M. Coté

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ECO SECURITIES



Overview

- Project Types
- The Project Cycle
 - Additionality
 - Baselines
 - Monitoring & Verification
 - Certification
- Issues?

Project Types

Eligibility and
Real World Potential

Commercial CMM Projects Worldwide Share These Attributes

- Recover otherwise wasted coalbed gas in marketable quantities
- Gas is used for fuel or feedstock by nearby industry, community or the mine itself
- Market price or cost savings makes the operation economically viable, but gas recovery is usually initiated for safety purposes.

Eligible Projects

- **CMM- fugitive emissions**
 - Working mines, vent gas ✓
 - Abandoned mines, fugitive emissions ✓
- **CBM- gas extraction**
 - Prior to mining operations (considered CMM) ✓
 - Isolated seams, trapped CBM (below) ✓
- **Energy Use -fuel switching**
 - At mine site ✓
 - Elsewhere ✓

Eligible Projects- Gas Use & Emissions Reductions?

Two Potential emissions reductions streams

- 1: Mitigation of fugitive CH₄ emissions
- 2: Displacement of fossil fuels

Likely uses of gas (& buyers perspectives):

- process heat, displacement of other *fossil* fuels
- electricity generation
- gas pipelines (questions of quality standards- Lattice UK)
- transport applications?
- flaring: *possibly seen as waste of energy?*

Eligibility defined by regimes- Kyoto Vs. Non-Kyoto - Neil

Carbon Project Finances- *Value Proposition, Making Things Happen*

CBM project- fuel switch:

- 40 MW electricity installed capacity
- 50,000 t CO₂ emission reductions per year (for 10 years)
- Project costs: US\$40m (+)
- Carbon value
 - @\$3 US/tonne CO₂e = \$1.72m US
 - @\$5 US/tonne CO₂e = \$2.87m US

-Proportion of project costs:

@ \$3/tonne	-4.3%
@ \$5/tonne	- 7.2%

CMM project- fugitive gas capture:

- 2 MW electricity installed capacity
- 50,000 t CO₂e (+) emissions reductions per year (for 10 years)
- Project costs: US\$3.5m
- Carbon value
 - @\$3 US/tonne CO₂e = \$1.72m US
 - @\$5 US/tonne CO₂e = \$2.87m US

-Proportion of project costs:

@ \$3/tonne	- 49.1%
@ \$5/tonne	- 82.0%

Message? Carbon Financing is not marginal but enabling!

ECO SECURITIES



Eligible Projects- Future?

CMM / CBM capture & sequestration of CO₂
coal beds?

- de-carbonisation (Schift reaction): fuel cell/hydrogen
- sequestration in coal beds & promotion of enhanced recovery
- acceptability gets slightly messy

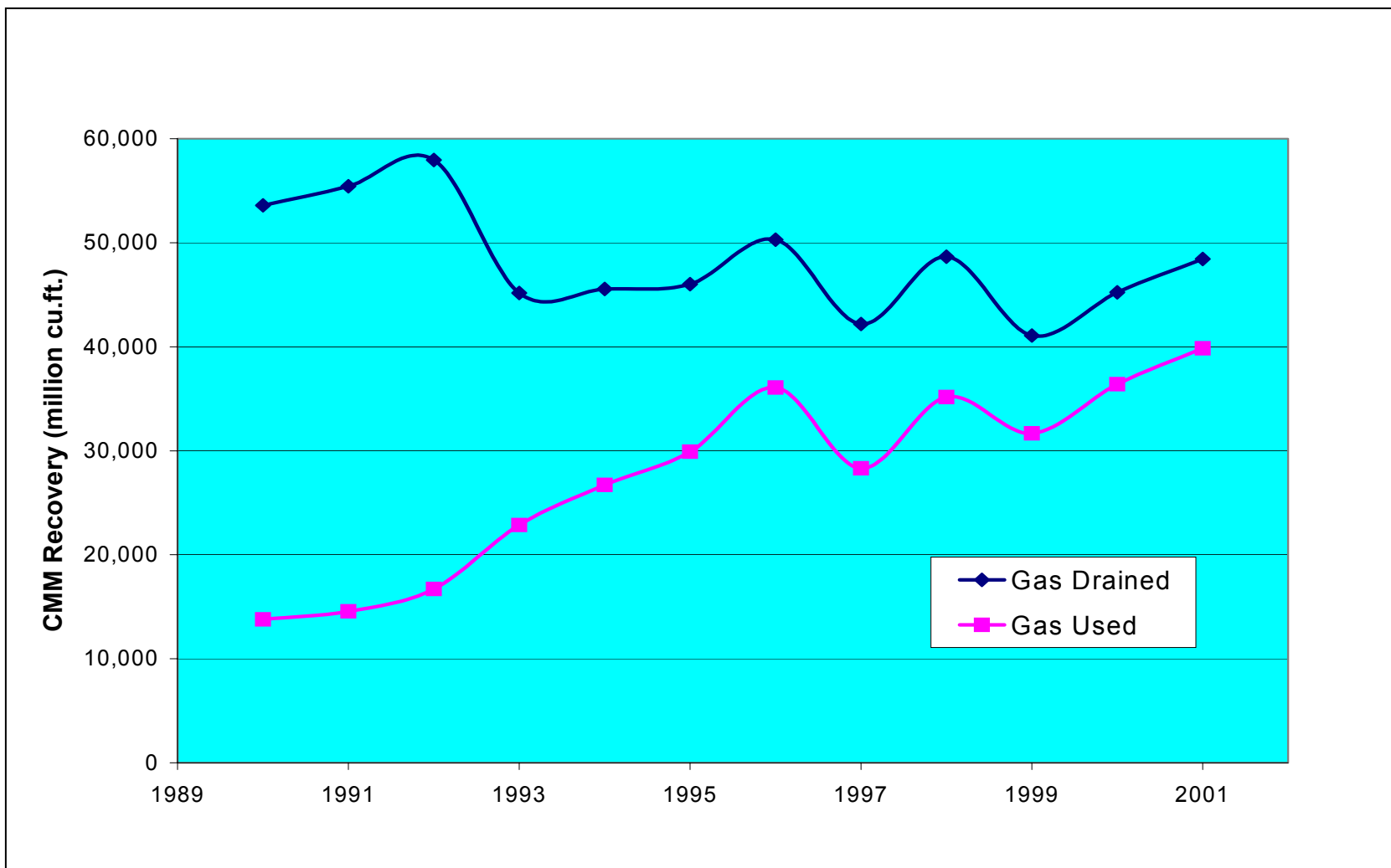
Issues

- permanence?
- additionality?
- environmental impacts
- permits

Contrasting Stages of CMM Development – USA and China

- In USA: since 1996, 72-82% of gas drained from mines has been recovered and used
- In China: recovery and use not keeping up with drainage operations, <45% in year 2000

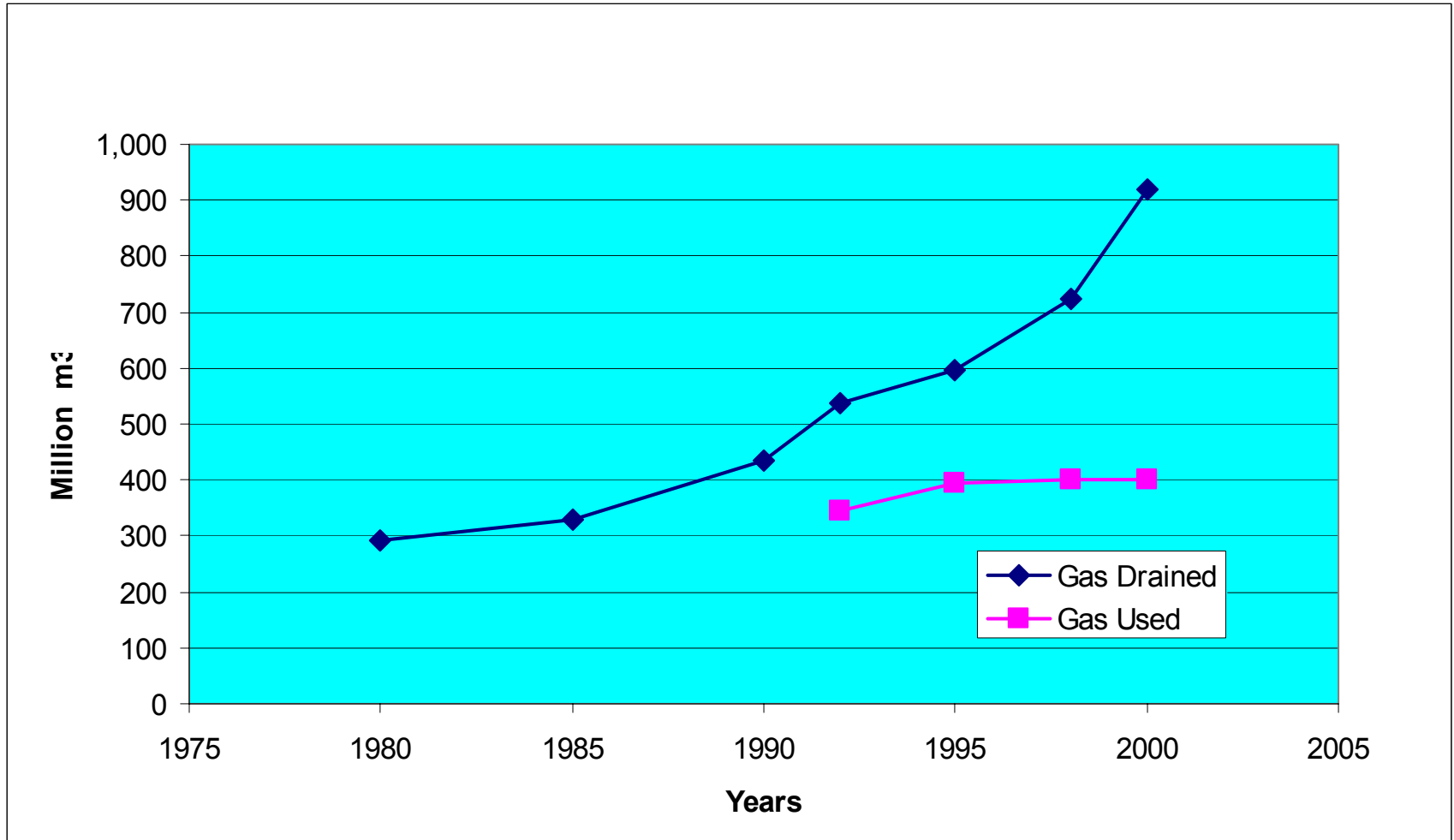
CMM Drained and Used in USA



ECO SECURITIES



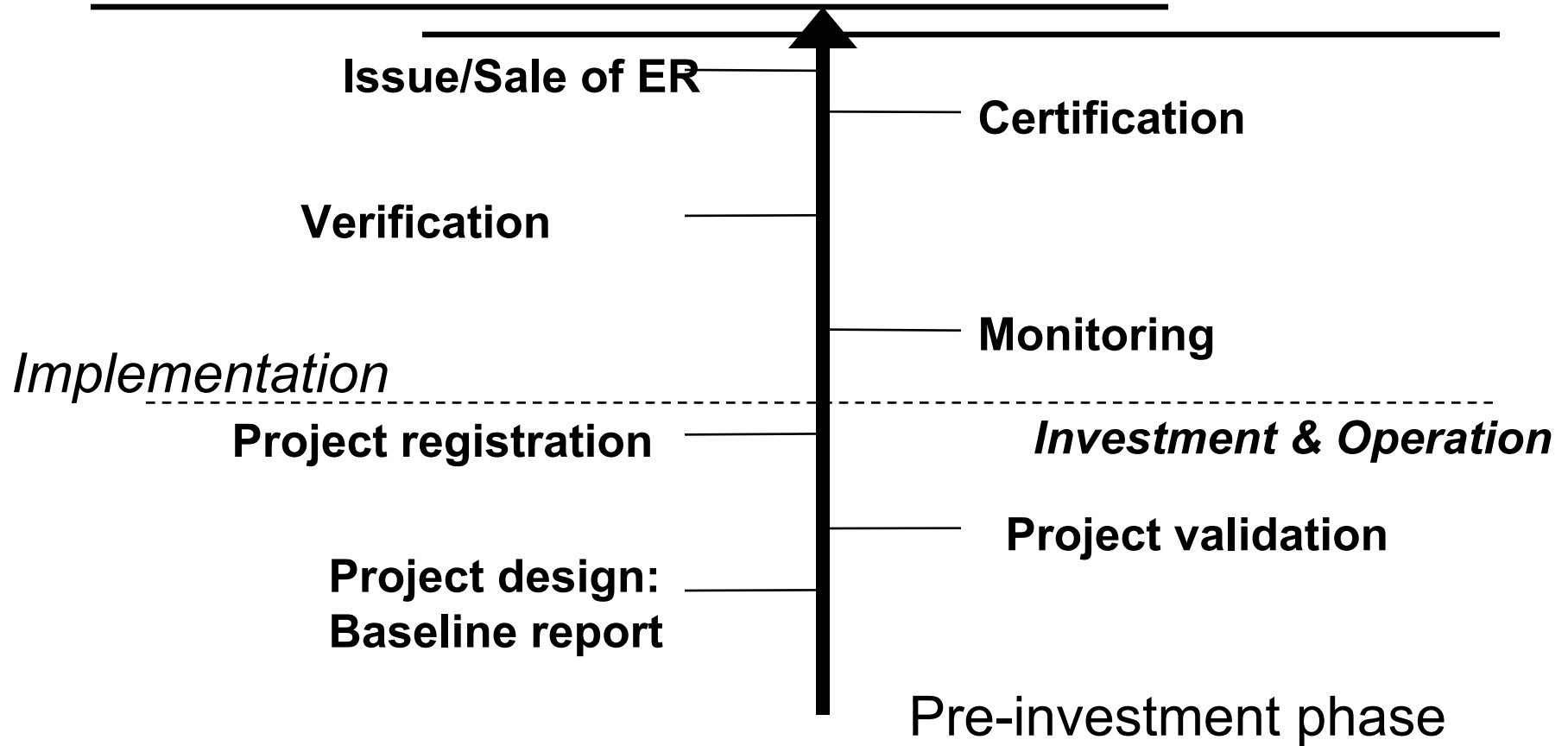
CMM Drained and Used in China



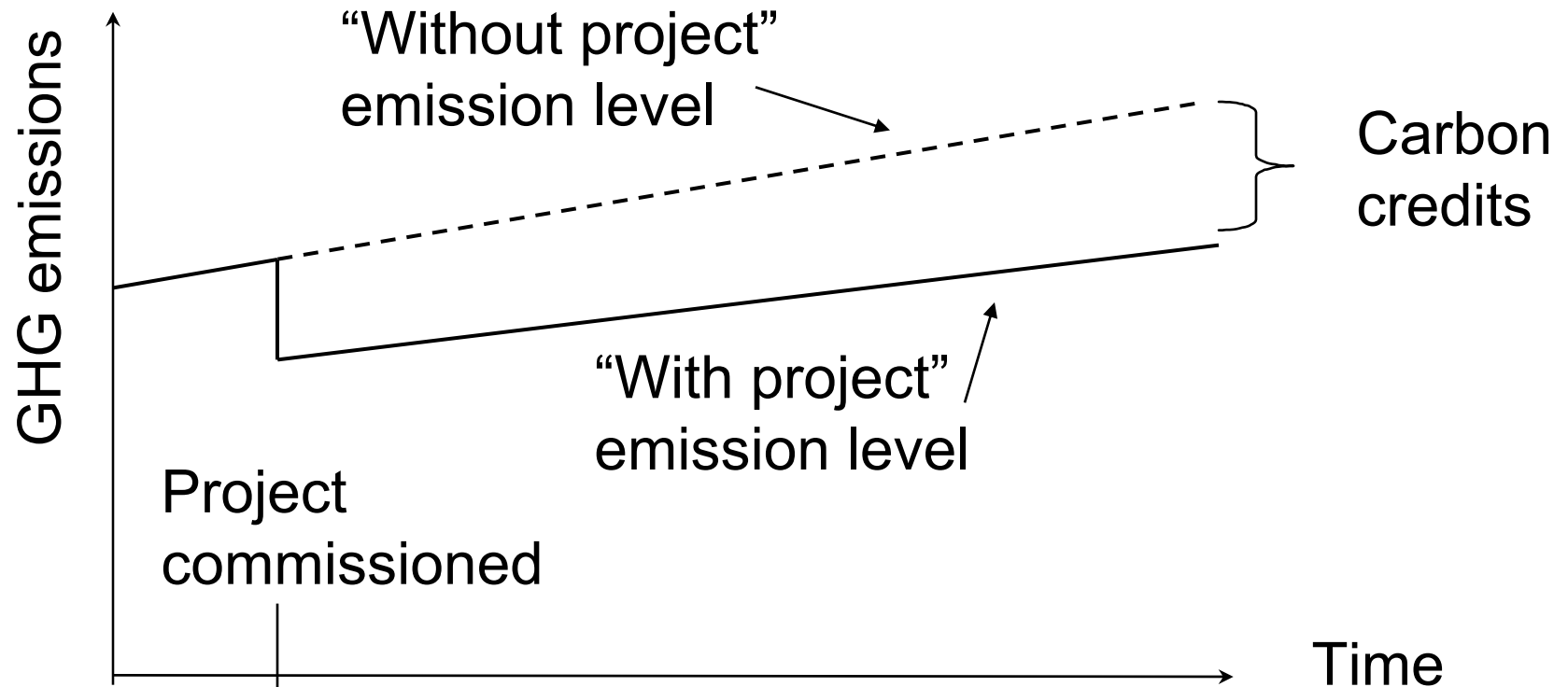
Project Cycle

Methodological Processes & CMM Specific Needs

Project Cycle



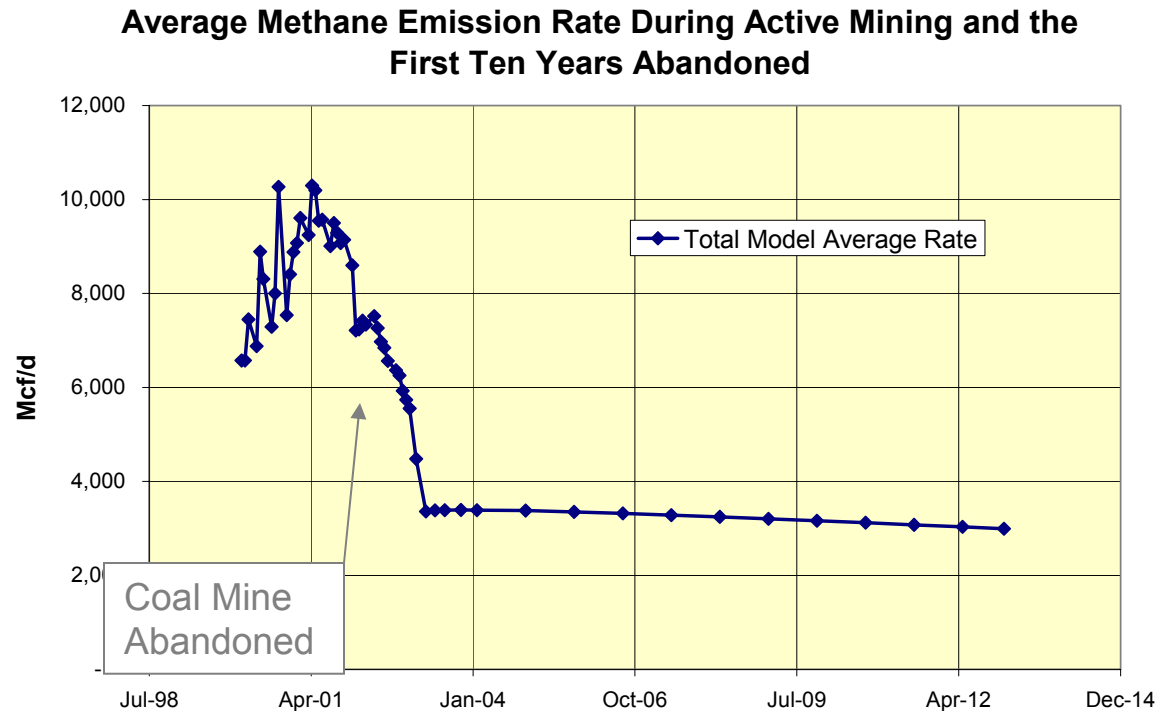
What's A Baseline?



Baseline Emissions for CMM Projects

- Establishing a Baseline
 - The baseline is the quantity of GHG emissions that would have been emitted conducting *business as usual*
 - For coal mining, annual mining rates and emissions change from year to year
 - Baseline must accommodate changing mining conditions and may vary from year-to-year
 - Futures years could be modeled

Example Model of Baseline Emissions During Active and Abandoned Time Periods



Additionality

- Numerous tests:
 - Investment
 - Environmental
 - Technological
 - Policy/legal
- Tests different for different regimes
 - Marrakech Accords & Kyoto, UK Gov etc

Additional Requirements

- *Credibility* -

Validation: by an independent third party:

Approval of the project activity as an emissions reducing project

Monitoring: by project developer:

Ongoing data collection of data to demonstrate project's success

Verification: by an independent third party:

The periodic review and *ex post* determination of the monitored reductions in emissions

Again- completely regime dependent

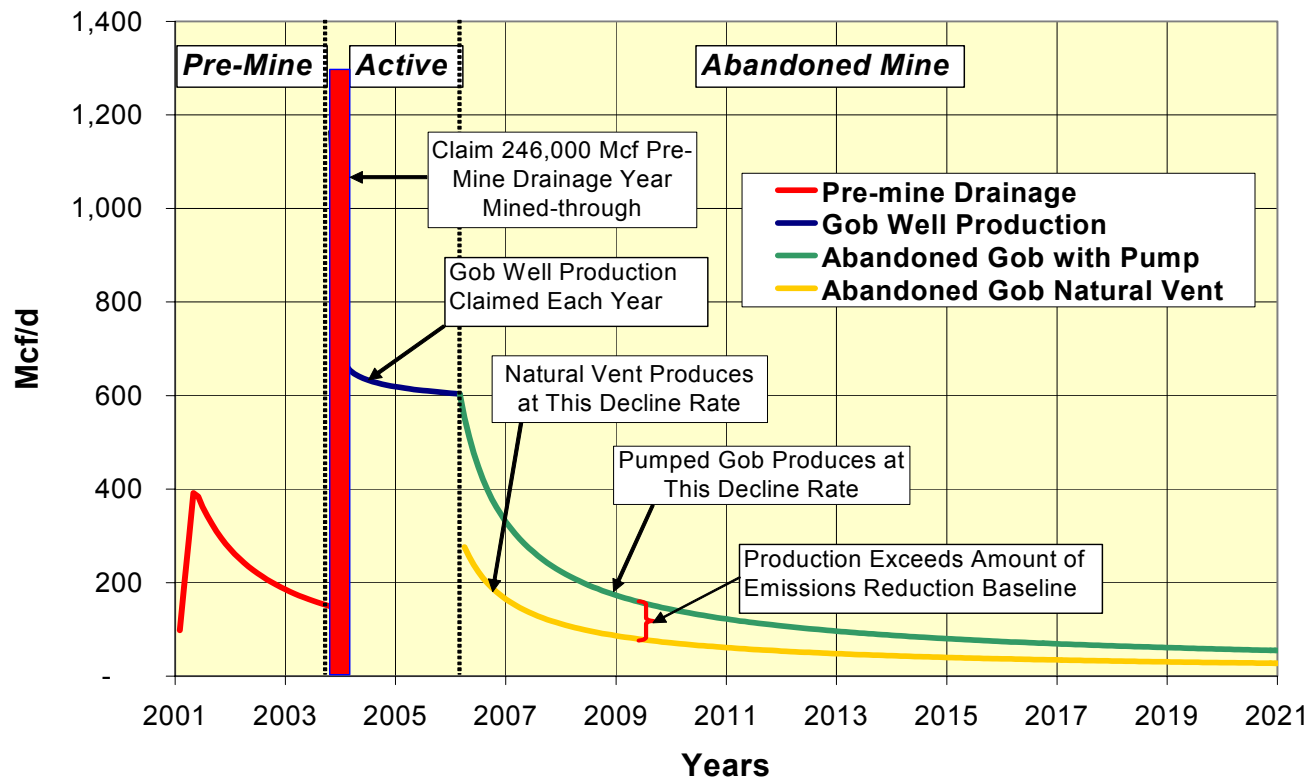
Environmental Benefits May Be in the Details of CMM Projects

- All gas produced may not qualify as emissions reductions
 - Need to compare to modeled baseline curves
 - Acceleration on abandoned mines
- Gas used on site and not sold may qualify
 - Methane-fueled compressors or blowers may use 5-8% of gas stream
 - Methane used in coal prep plant or thermal dryer
 - On-site use for heat and power

Quantifying Emissions Reductions

- Establish the **Vintage** of the Reduction – When Did the Reduction Occur
 - The ***vintage*** of the credits of pre-mine drainage production are delayed to the year when the drainage area is mined through
 - The ***vintage*** of the credits of gob well drainage of an active mine should be at the time of capture
 - The ***vintage*** of the credits of abandoned mine methane recovery may be forwarded to future years

Timing Emission Reductions and Associated Revenues



Monitoring Processes

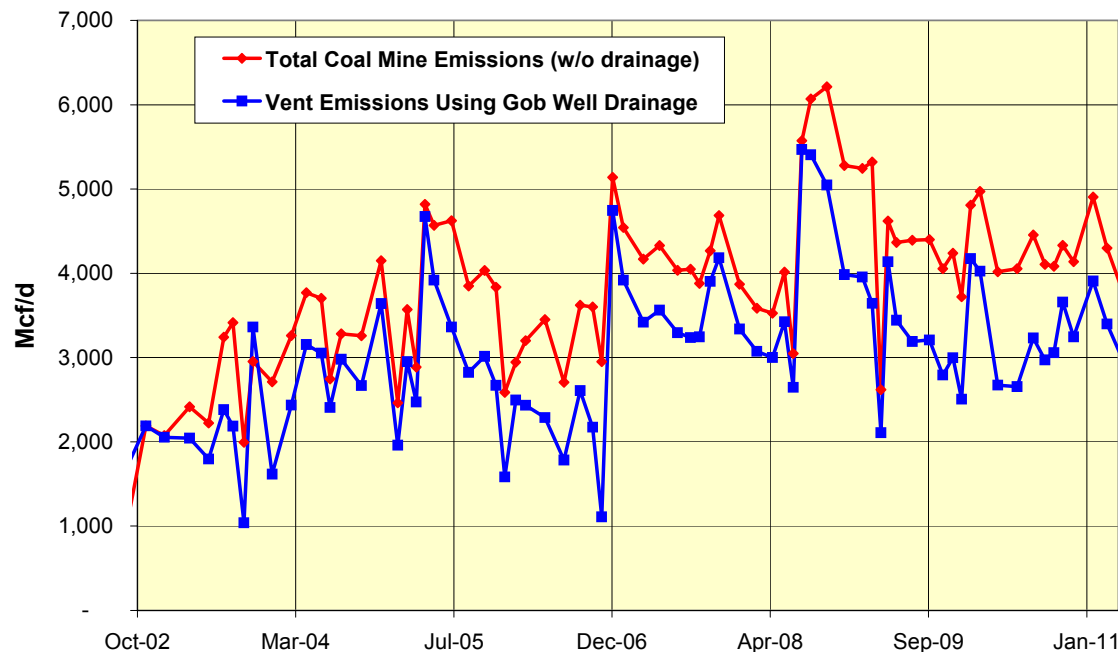
- Lead directly to ultimate value capture via certification
- Requires rigorous management techniques to capture required information (quality and volume)
- Third Party Certification may be required (Kyoto), but it adds creditability for a buying party

Active Coal Mine Monitoring Techniques

- Gob well production may exceed actual ventilation fan emissions reductions
 - Model can display the differences
- Need to establish the effective drainage radius of pre-drainage wells
 - Some wells may not actually ever be mined through, but production may contribute to emissions reduction in the coal mine
 - Similar to qualifying wells for Section 29 Tax Credit
 - Applies to surface mining as well

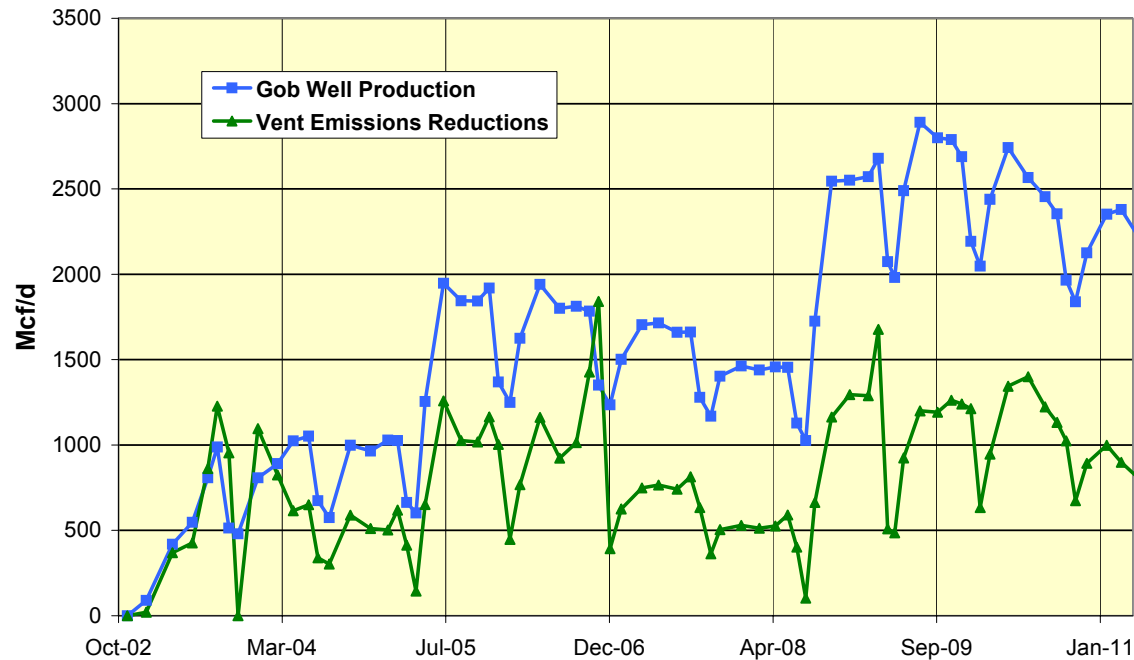
Example of Gob Well Drainage on Active Mine Emissions

Predicted Effect of Gob Well Drainage On Coal Mine Ventilation Emissions



Example of Difference Between Gob Well Production and Actual Emissions Reductions

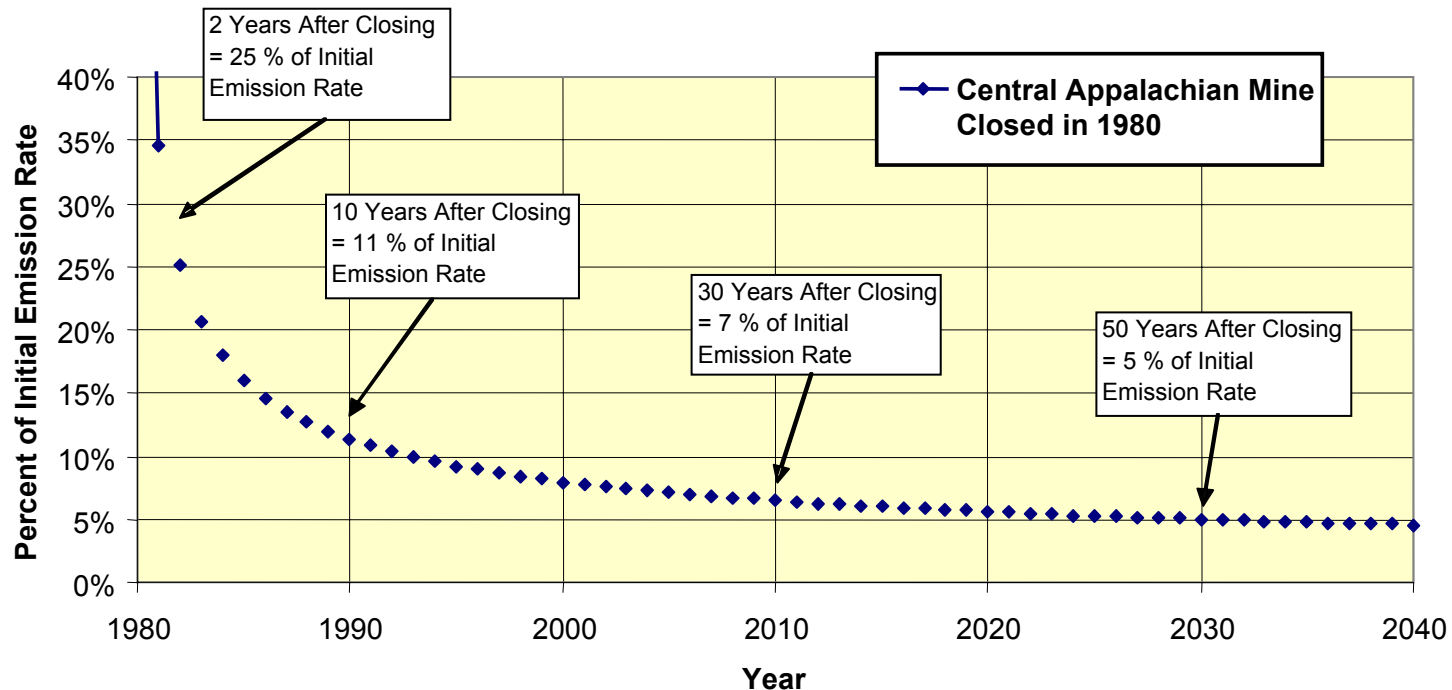
Gob Well Production vs Emissions Reductions



Abandoned Coal Mine Monitoring Techniques

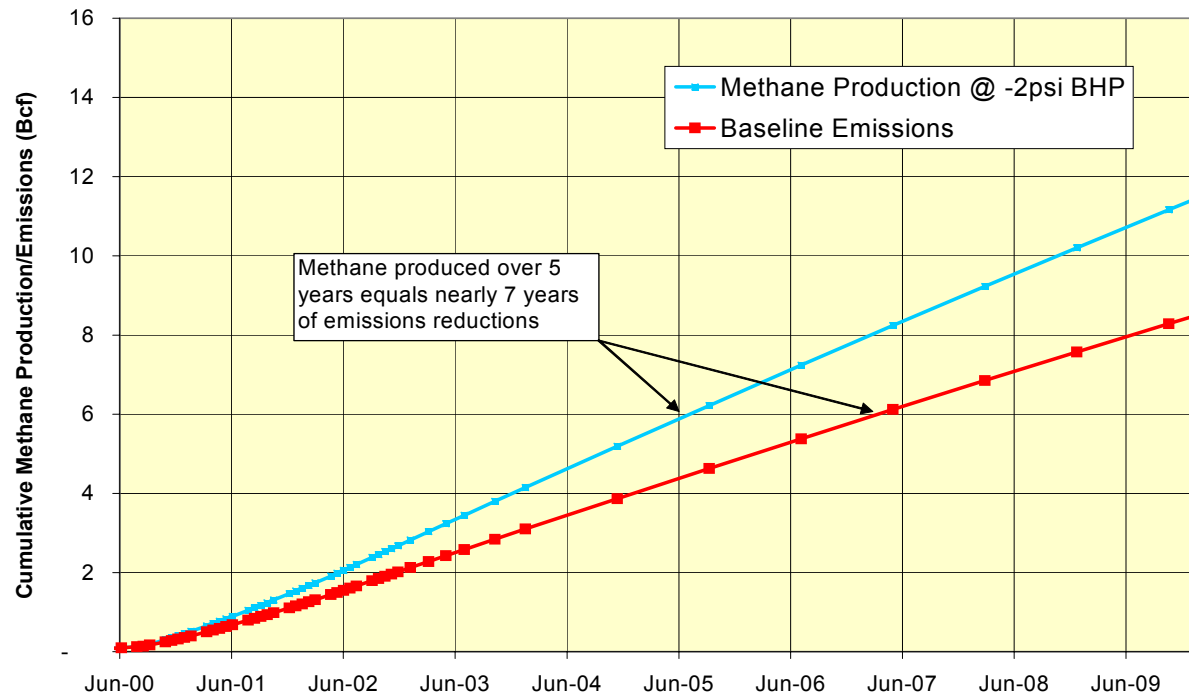
- Not recognized by IPCC GHG inventories yet...
 - Baseline may be included by 2006
- Gas production may exceed established baseline decline curve
 - Enhanced recovery may be marketed as emissions reductions in future years
 - Associated time-value
- Site-specific emissions rate
 - Methane leakage from abandoned mine shafts and vents may be more or less than modeled baseline
 - Adjust baseline based on field data, although diffuse emissions are difficult to measure

Typical Abandoned Mine Emissions Decline Curve



Tracking the Abandoned Mine Emissions Reduction Vintage

Cumulative Methane Production vs Baseline Emissions



Attributes of Certifiable GHG Emission Reduction Projects

- Projects must be clearly designed to recover GHG's that would otherwise escape to the atmosphere
- Projects must reduce GHG's to levels below that of documented baseline emissions
- Reductions must be verifiable using accepted monitoring practices and certified by experts from third parties.

Certification Process

- Under Kyoto a very specific process
- Point at which a third party puts its stamp of approval on a project
 - Acts as a recommendation to the CDM Exec' or JI Sup' Committee to issue 'credit'
- Only at this point is the asset created

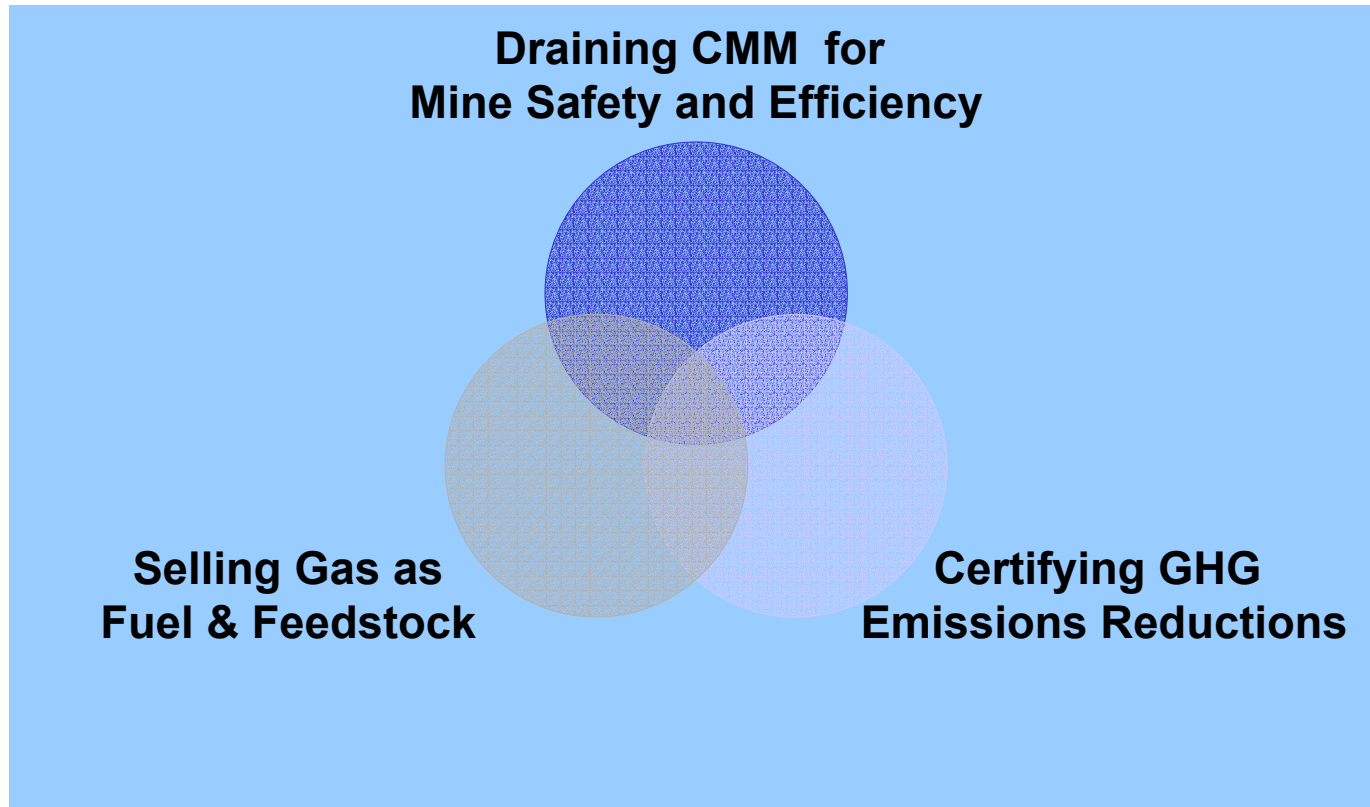
Certification Process

- Often used to mean the whole baseline process
 - Especially the baseline process
 - Relevant to non-Kyoto projects
- Essentially, the process by which a project is seen to have **credibility**
- 3rd Party opinion, that emissions are:
 - Real & verifiable
 - Acceptable!

Issues

Commercial Impacts of Carbon Trading

Understanding the Issues



Emission Reduction Issues Associated with New vs. Established Recovery Systems

Emission Reduction Issues Similar For Both

- Documenting Baseline
- Designing system that it is not just expansion of “business as usual”
- Installing monitoring system that documents claimed “additionality”

Commercial Issues Associated with New vs. Established Recovery Systems

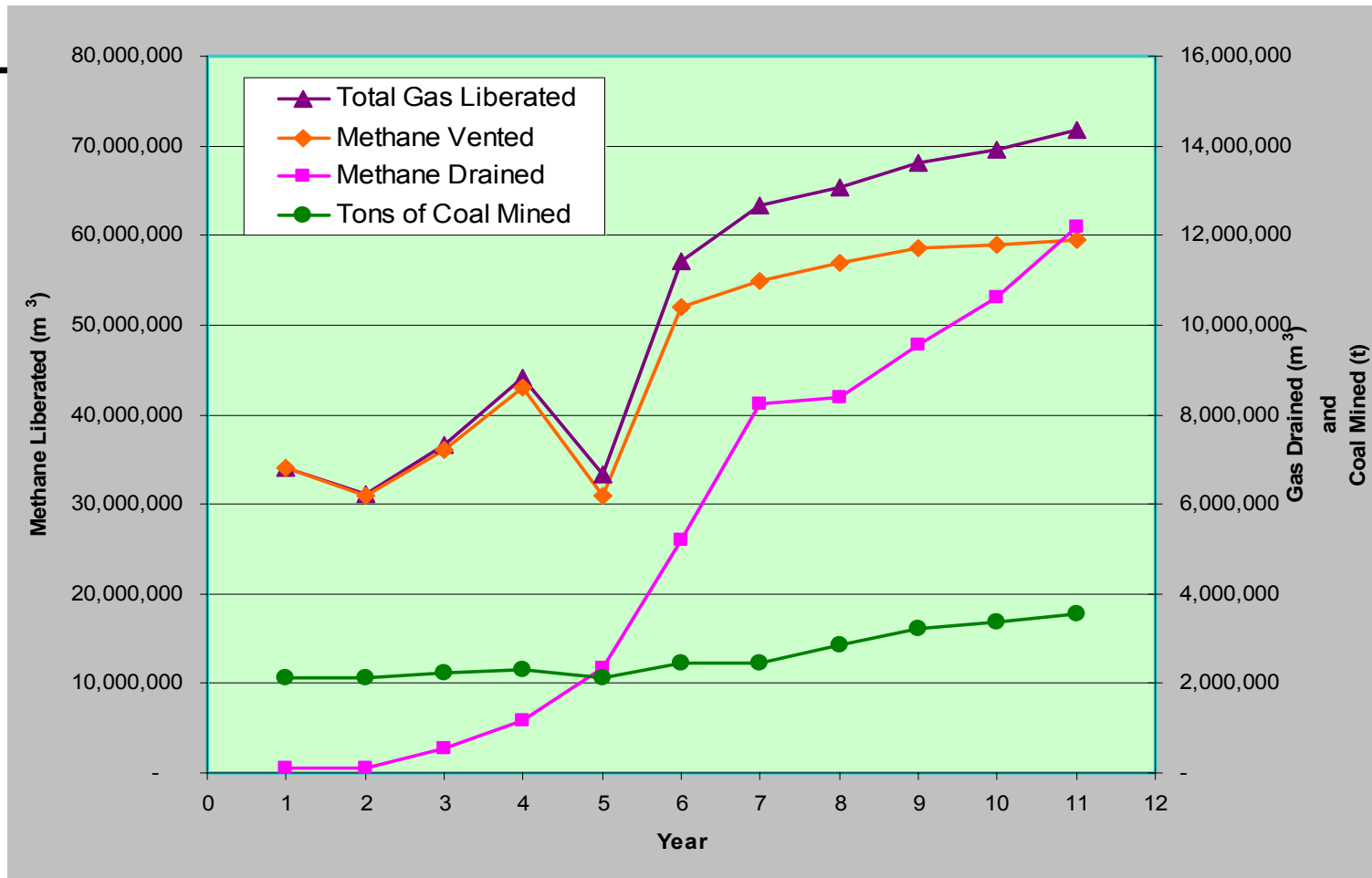
New Recovery System

- Forecasting and increasing production
- Establishing market
- Receiving adequate price for product
- Achieving stable commercial production

Established Recovery System

- Increasing drainage efficiency
- Expanding market
- Receiving fair price for product (may require re-negotiation of old contracts)
- Life of project compared with payout

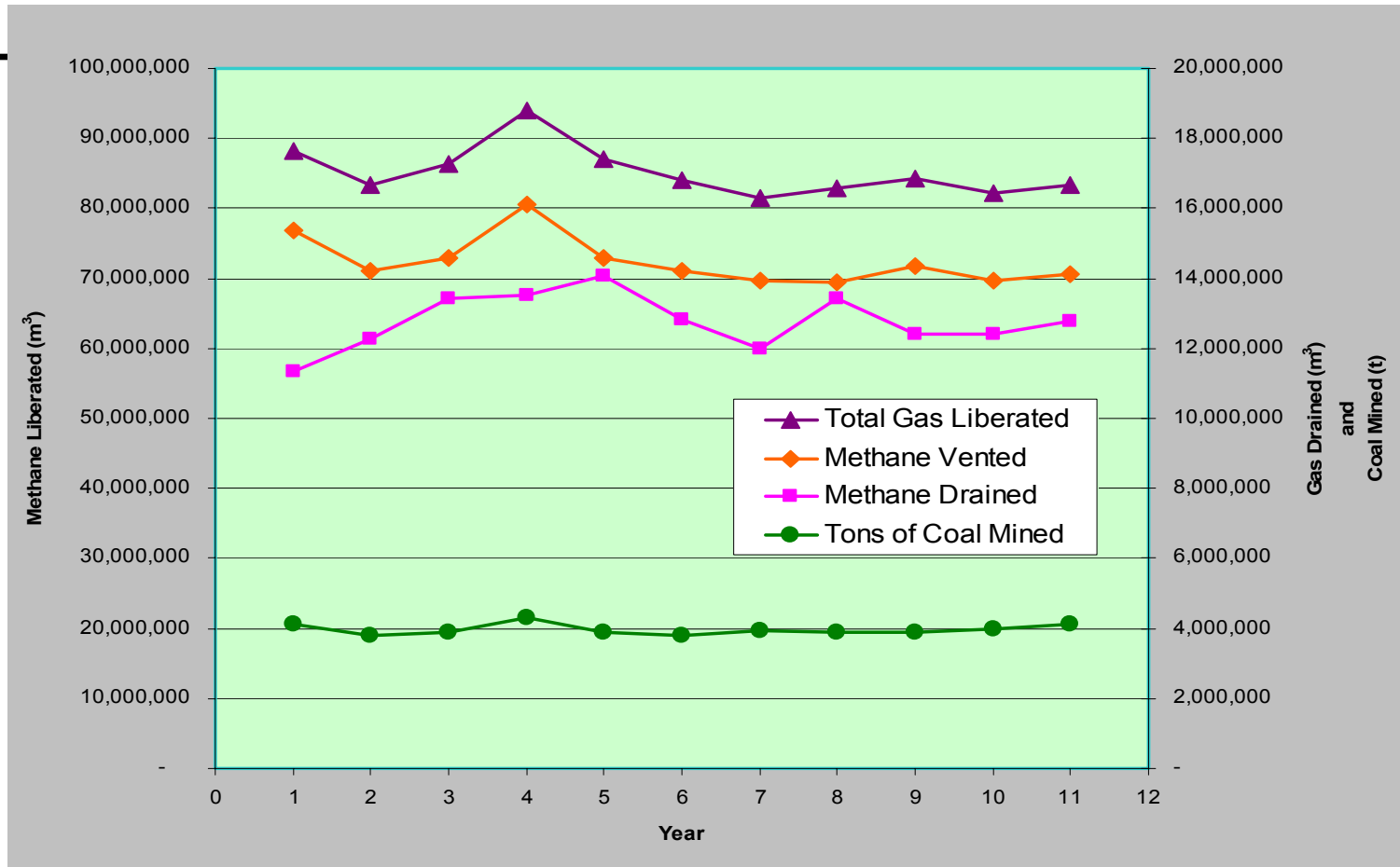
Mine With New Drainage System



ECO SECURITIES



Mine With Mature Drainage System



Significant Barriers

- Potentially significant transaction costs
 - \$75-100k costs under Kyoto
 - Min 40-50kt per annum projects
 - 1.5 - 2MW electricity
- Psychological issues over supporting coal & hence eligibility pressures
 - EU Emissions Trading Scheme, World Wildlife Fund Gold Standard, Chicago Climate Exchange

Significant Barriers

- Information- *is King*
- Need to collect, manage and maintain information
- Training, management systems
 - physical and otherwise
- Not part of core business of operators

Investment Concerns

- Determining best way to finance new facilities, i.e. debt and/or equity, sales of carbon credit
- Determining proportion of ownership in production and revenues if outside investors are involved
- Risk mitigation- both from commercial perspective and perspective of producing marketing ER's (contractual guarantees)

Closing Comments

- Many potentially viable GHG ER coal mine methane projects
- Project type, eligibility, and effort required is regime dependant
- Requires commitment and a strong management team to plan and implement
- Information management a requirement what ever the regime
- Additionality first hoop to leap through
- Third part certification may be required, but it also adds credibility

What Does the Coal Industry Need to Do?

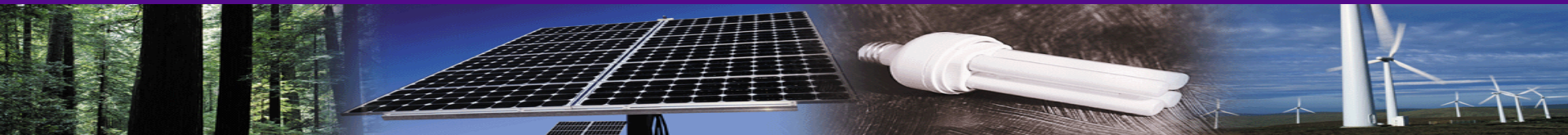
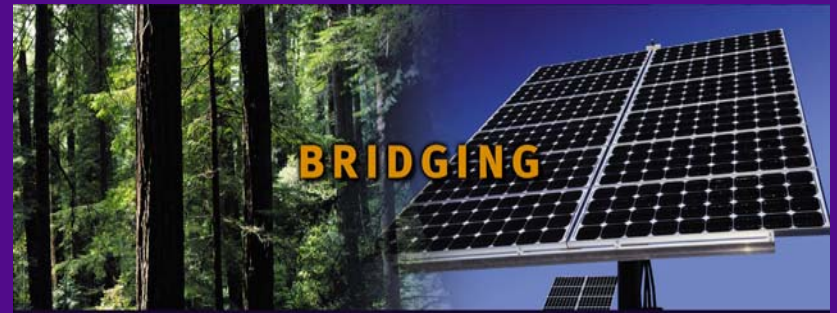
- Help establish methodology for baseline protocols
- Ensure acceptability of the methodology by GHG market mechanisms
- Document GHG emissions and reductions
- Work with and become part of the GHG marketplace
 - Alkane Energy & ACMMO - UK
 - Northwest Fuels & Pacificorp - USA

The Buyers in the GHG Mitigation Market

2003 International Coalbed
Methane Symposium
May 7-8, 2003

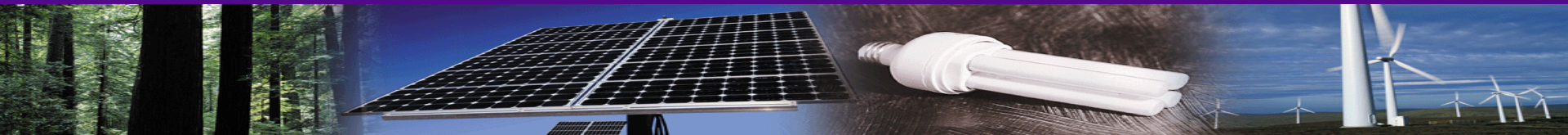
Dr. Mark C. Trexler

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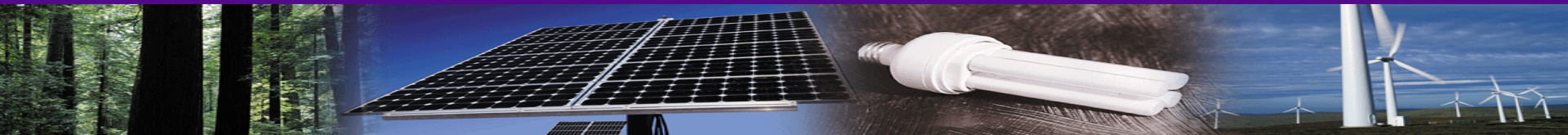
Setting the Context

- ✓ It's a Tricky Market
- ✓ Buyers Are a Heterogeneous Group
- ✓ Important to Understand What Buyers Are Looking For, and the Implications for Sellers
- ✓ The Near Term Market Price for CO₂ is Low, but Still Significant In the Context of CMM Projects
- ✓ CMM Deals CAN be Done Even in Today's Market Environment
- ✓ Actions Today Are Important to Being Positioned for Future CMM Deals



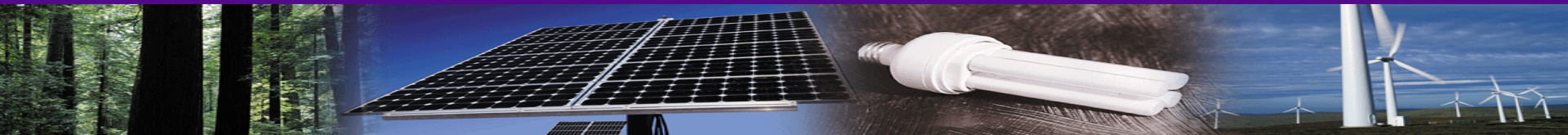
A Multi-Personality Market

- ✓ Demand Driven by Voluntary Targets, Market Positioning
 - Domestic U.S. (non-Kyoto) Demand
- ✓ Demand Driven by Anticipatory Compliance and Risk Management
 - EU Demand (EU Trading System)
 - International (Kyoto) Demand
- ✓ Different “Personalities” Act Differently in the Market, and Look for Different Things



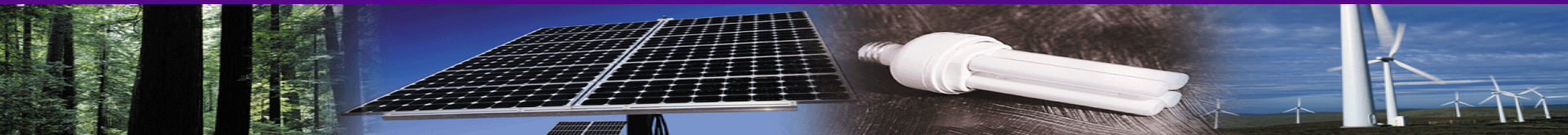
Voluntary/Sustainability Market

- ✓ Companies With Voluntary Commitments
- ✓ Companies Promoting Brand Recognition, Market Share
- ✓ Municipalities and Others Wishing to Make a Statement
- ✓ Third Parties Seeking to Provide New Services
 - Offset travel, electricity
- ✓ A Small Market That Could Grow Rapidly, but Faces Challenges



The Compliance Market

- ✓ In Europe, Compliance with 2005 Trading System
- ✓ In Japan, Canada, Anticipating Kyoto Mandates
- ✓ In U.S./Canada, Developing State/Provincial Rules?
 - Several states have or are considering CO₂ mandates
 - To what extent will offsets be allowed?
- ✓ A Natural Market Focus on Uncertainties
 - Will we have mandates, when, how severe?
 - What will the market clearing price of credits be?
 - When do we need to act?
- ✓ Uncertainty Leads to Inaction, Low Willingness to Pay



Sample Low Demand Forecast

Scenario

Worldwide GHG Demand

Demand Totals (MMtCO ₂ E)			
	Round 1	Round 2	Round 3
w/ sinks + HA	566	4344	7904
w/ sinks, no HA	1808	4344	7904
no sinks, no HA	1919	4649	8257

Emissions growth scenario

Reference

Include Developing World

yes

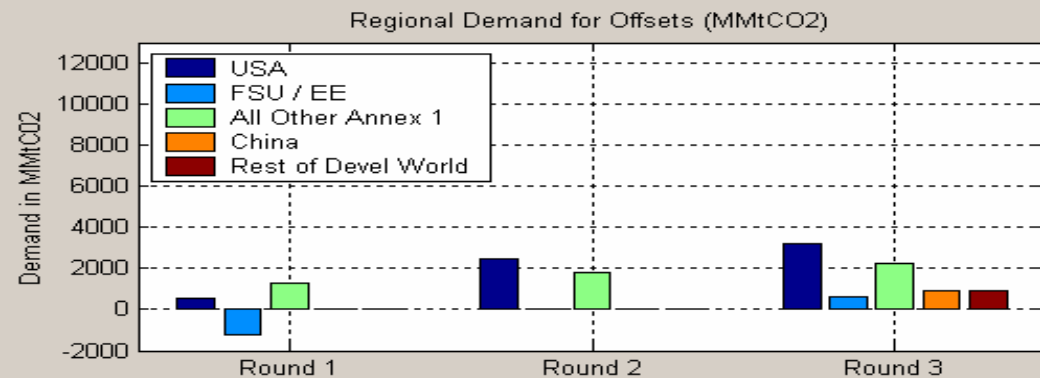
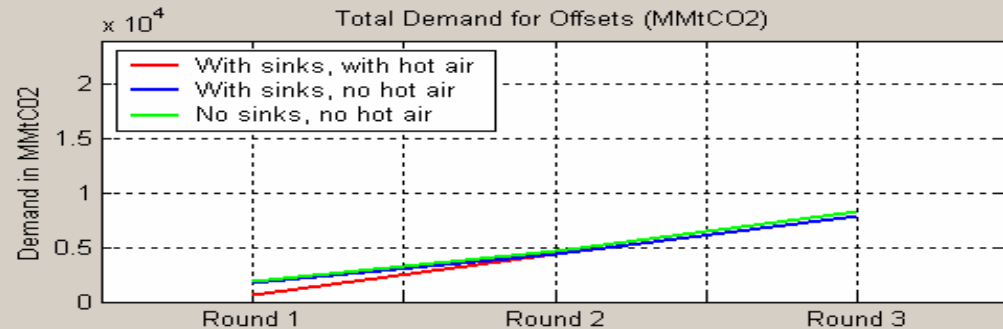
US Participation by Round

0% = No US participation
100% = Full US participation
and adopts Kyoto targets

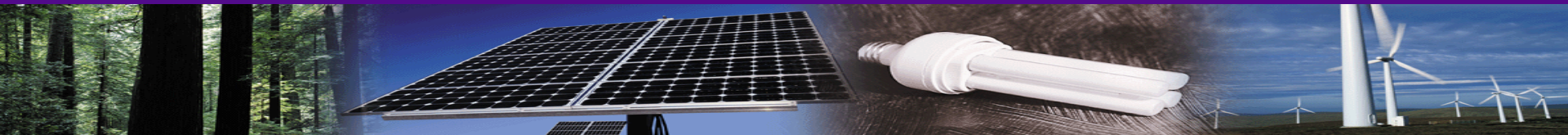
Round 1 %

Round 2 %

Round 3 %



Source: TAA Forward Price Curve Model, 2003©



Sample High Demand Forecast

Worldwide GHG Demand

Demand Totals (MMtCO ₂ E)			
	Round 1	Round 2	Round 3
w/ sinks + HA	1876	7149	14231
w/ sinks, no HA	2877	7278	14231
no sinks, no HA	3944	8345	15923

Emissions growth scenario

High

Include India and China

yes

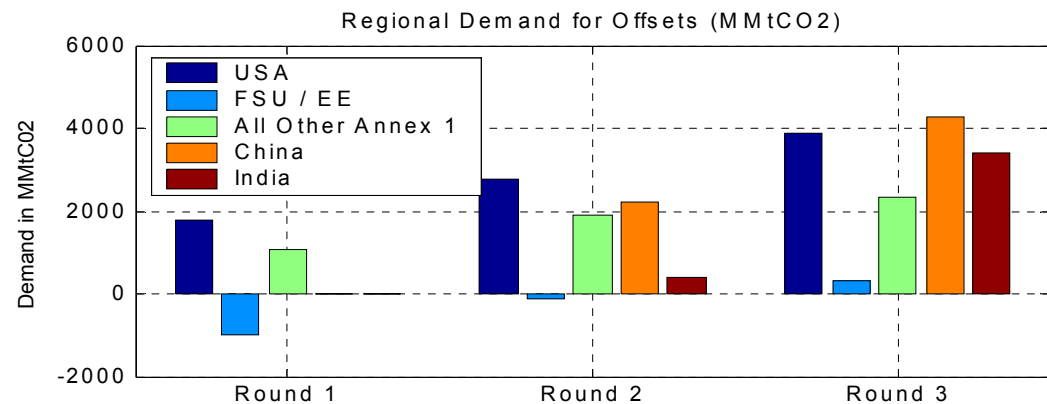
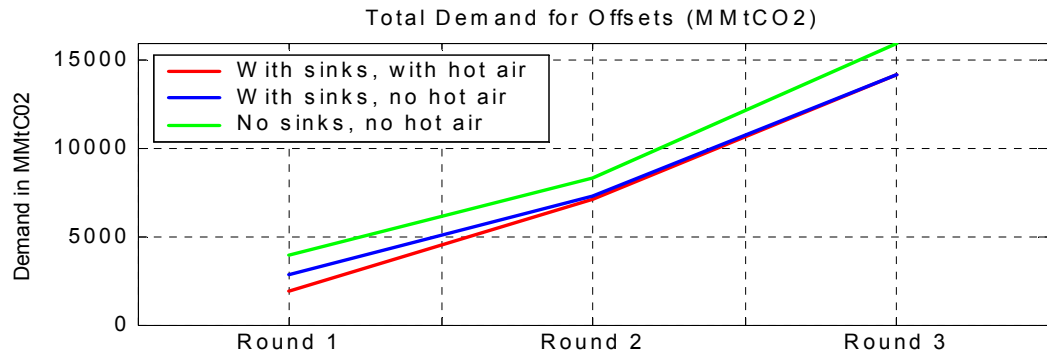
US Participation by Round

0% = No US participation
100% = Full US participation
and adopts Kyoto targets

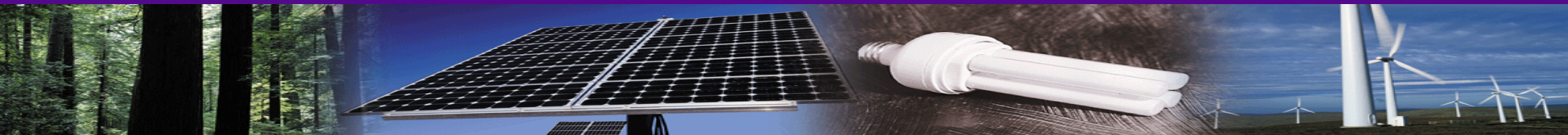
Round 1 100 %

Round 2 100 %

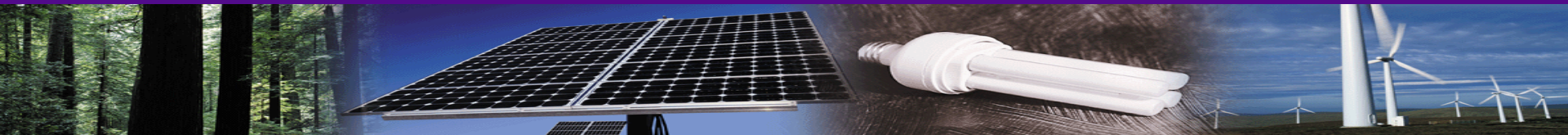
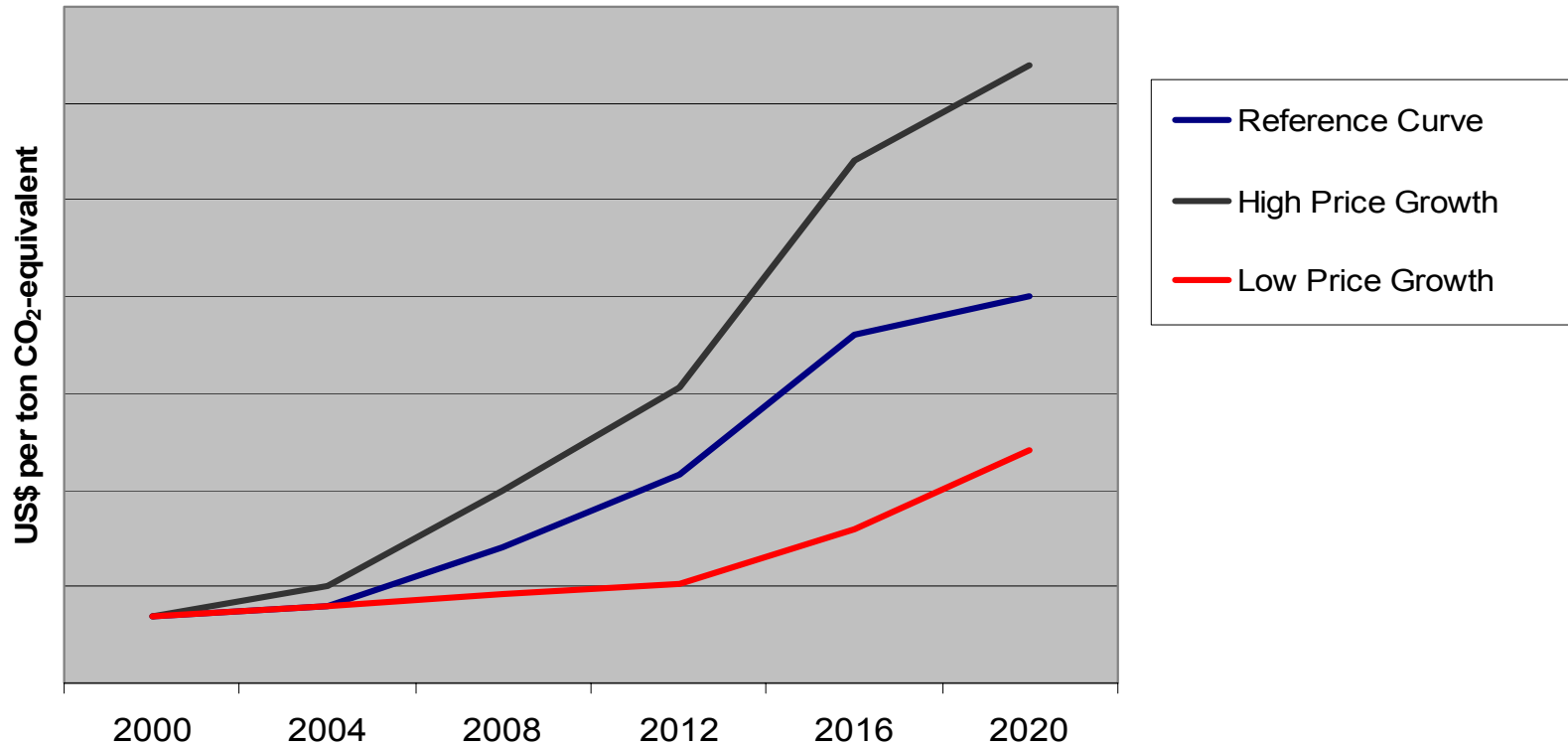
Round 3 100 %



Source: TAA Forward Price Curve Model, 2003©

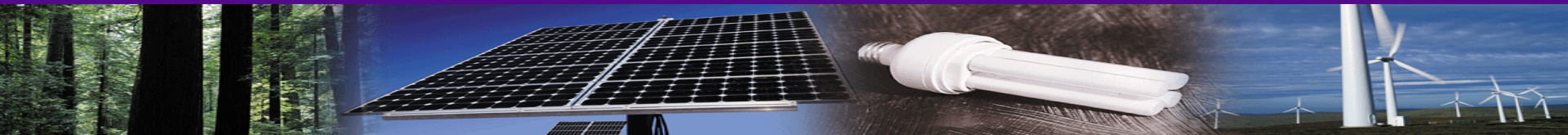


What Makes Sense Today?



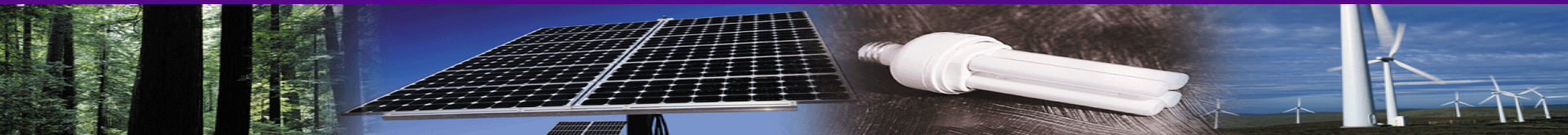
Who Are the Buyers?

- ✓ For Domestic Projects, Market is Weak
 - Absence of federal policy (or even direction)
 - Natural market, the utilities, in a weakened state
 - Many interested companies not yet thinking offsets
 - Most companies thinking offsets want to sell, not buy
 - With exception of Canada, international sales of U.S. reductions unlikely
 - State mandates creating a very limited market
 - ✓ Oregon, Washington CO₂ standards
 - Will we see more market based demand drivers?
- ✓ “Right Place, Right Time” Opportunities Will Exist



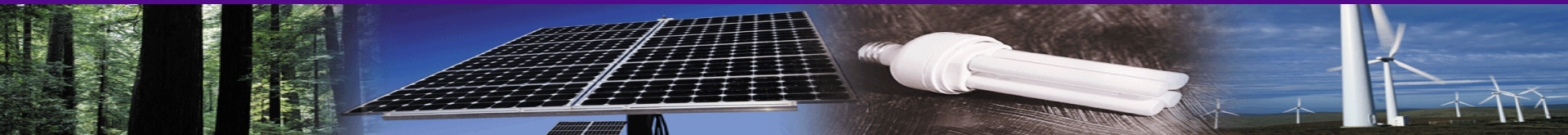
Who Are the Buyers?

- ✓ For International Projects, a Limited Market
 - Primary buyers right now are government/private sector funds
 - ✓ World Bank carbon funds have collected several hundred million dollars
 - ✓ The Dutch are funding significant credit procurement efforts
 - ✓ The Japanese are developing carbon funds
 - Project development and credit buying by individual companies still relatively limited
 - ✓ In Canada, Japan
- ✓ But This Market Could Expand Very Rapidly!



Buyers Have Market Entry Options

- ✓ Current Market Entry Mechanisms Include:
 - Forward purchase of project-specific credits
 - GHG equity investments that generate credits
 - Spot purchases of CO₂ credits
 - Purchases of options w/low up-front costs
 - Participation in a growing number of investment funds claiming real or potential GHG returns



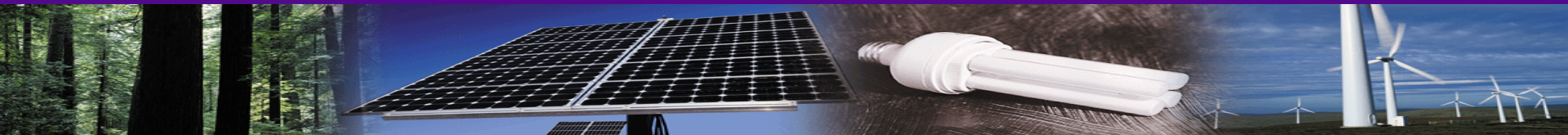
Identifying Buyers' Questions

✓ If Compliance Oriented:

- Is it low cost, low risk?
- Can I pay as I go?
- Will the reductions count against future mandates?
- Is ownership of the reductions clear?
- What kinds of guarantees are being offered?
- Why now?

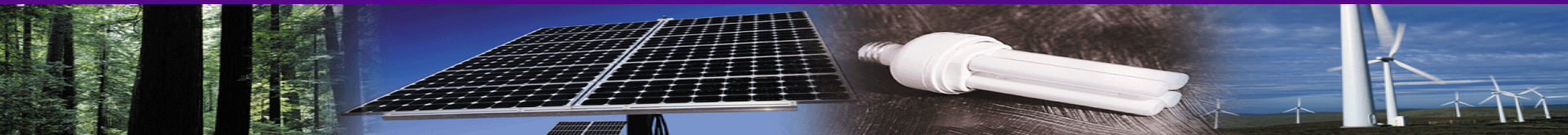
✓ If Voluntary:

- Can I afford it?
- It is high quality (from stakeholders perspective)?
- Are there clear co-benefits?



Being Positioned for Future Deals

- ✓ Opportunities Come and Go; Requires Tracking
- ✓ Increasingly Difficult to Respond to Opportunities Without Advance Planning, Particularly for CMM
- ✓ Advanced Thinking Pays Off For:
 - Establishing baselines and demonstrating additionality
 - Ownership of reductions
 - Knowing your revenue requirements
 - Knowing how you are willing to structure a deal
 - Willingness to provide guarantees (type and magnitude)
- ✓ Having the Elements of a GHG Business Plan in Place

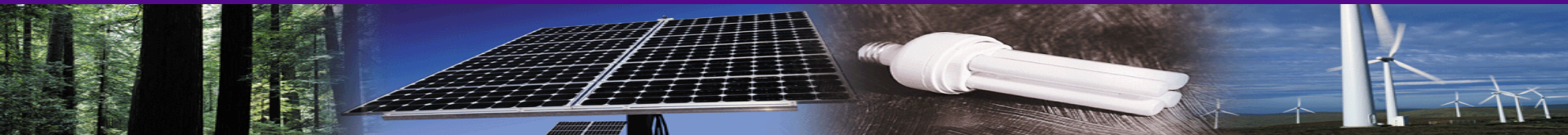
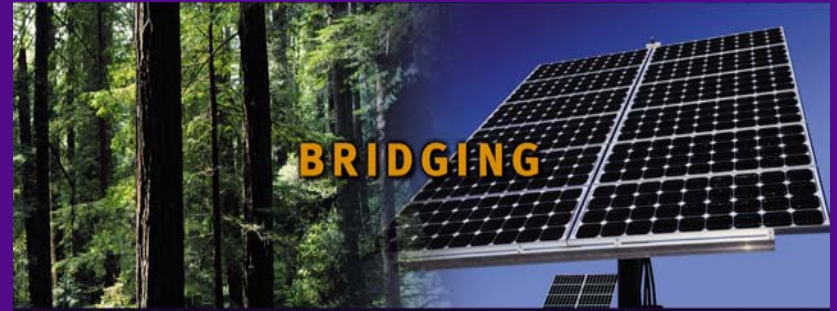


Why CMM Can Compete for Limited Demand

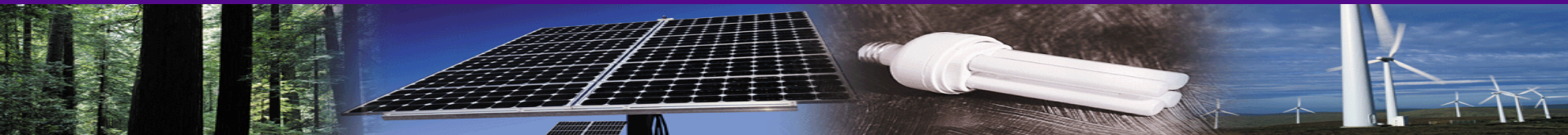
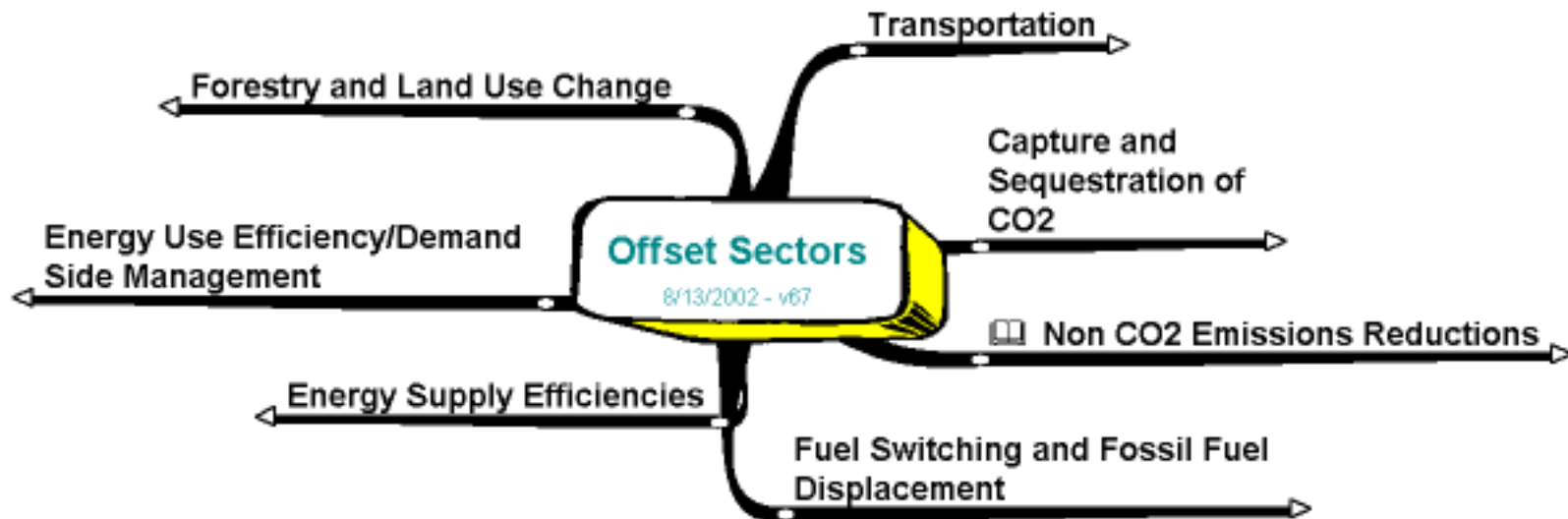
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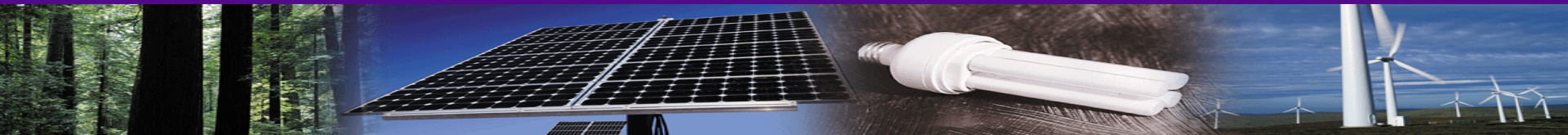


The Range of Offset Sectors



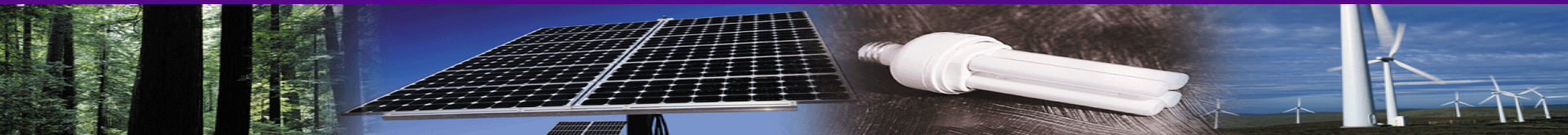
Comparing Offset Sectors

	Ease of Implementation/ Likelihood of Project Success						Summary
	Measurable & Verifiable Reductions			Ease of Baseline Development		Results in Direct Reductions	
	Clear Ownership of Reductions		Positive Ancillary Benefits				
Landfill Gas Recovery	Excellent	Excellent					
Coalmine Methane Recovery	Excellent	Excellent					
Biomass Energy	Good	Excellent					
Energy Use Efficiency - Industry	Good	Excellent					
Afforestation and Reforestation	Good	Excellent					
CO2 Sequestration (Enhanced Oil and Gas Recovery)	Poor	Excellent					
Inter-Fossil Fuel Switches	Good	Excellent					
Energy Use Efficiency - Commercial	Good	Excellent				Fair	
Improved Agricultural Practices	Fair	Excellent				Good	
Energy Use Efficiency - Residential	Fair	Excellent				Fair	
Transportation - Behavior Changes	Poor	Excellent				Good	

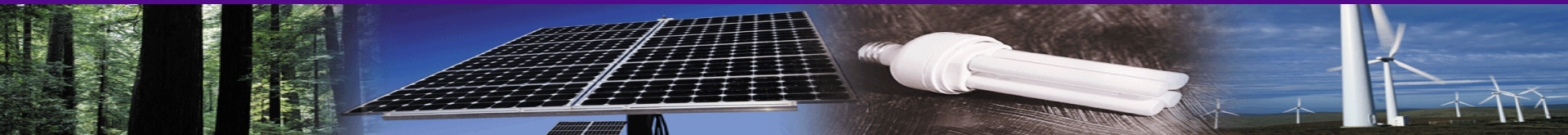
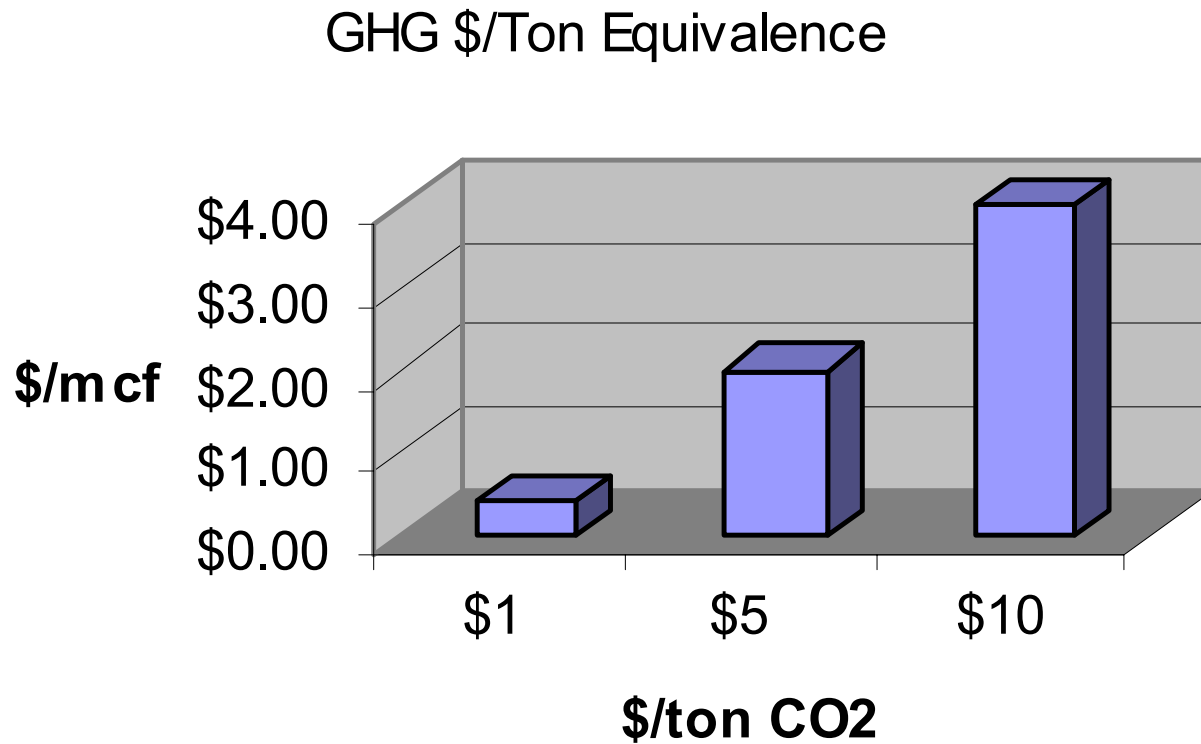


What Drives GHG Economics?

- ✓ Financing
- ✓ Capital Costs
- ✓ Operating Costs
- ✓ Fuel Costs
- ✓ Revenue Streams
- ✓ Tax Rates
- ✓ Depreciation
- ✓ Rate of Return Requirements
- ✓ Scale
- ✓ Technology
- ✓ Infrastructure
- ✓ Project Life
- ✓ Location
- ✓ Markets
- ✓ Performance Risks
- ✓ Policy Risks
- ✓ Credit Transfer Risks
- ✓ Baselines
- ✓ Operator Experience
- ✓ Transaction Costs

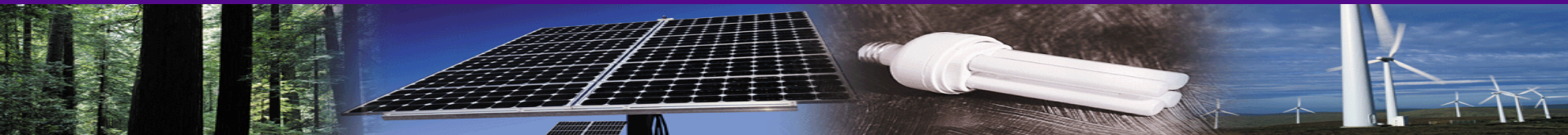


CO₂ Value Per MCF



Potential CMM Project Economics

- ✓ GHG Credits CAN Significantly Affect CMM Projects
- ✓ Even Small Emission Sources can Have a Significant Value, Based on Alternative Forward Price Curves
- ✓ Values Rise Quickly Project Lifetime is Extended, Because GHG Credit Prices Likely to Rise Significantly in Later Years

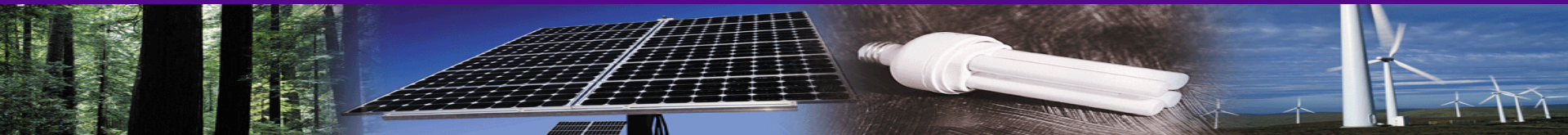


CMM Carbon Economics

**Net Present Value of Alternative Project Sizes and Lifetimes
(TAA Modeling of GHG Market Prices)**

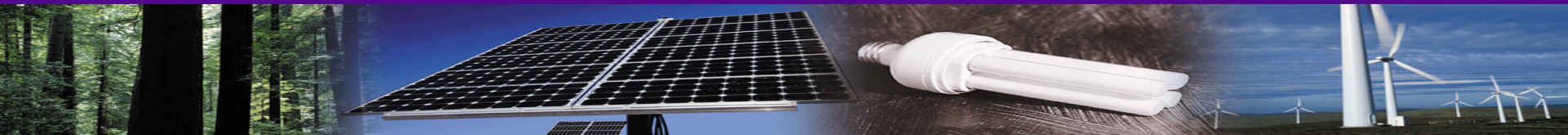
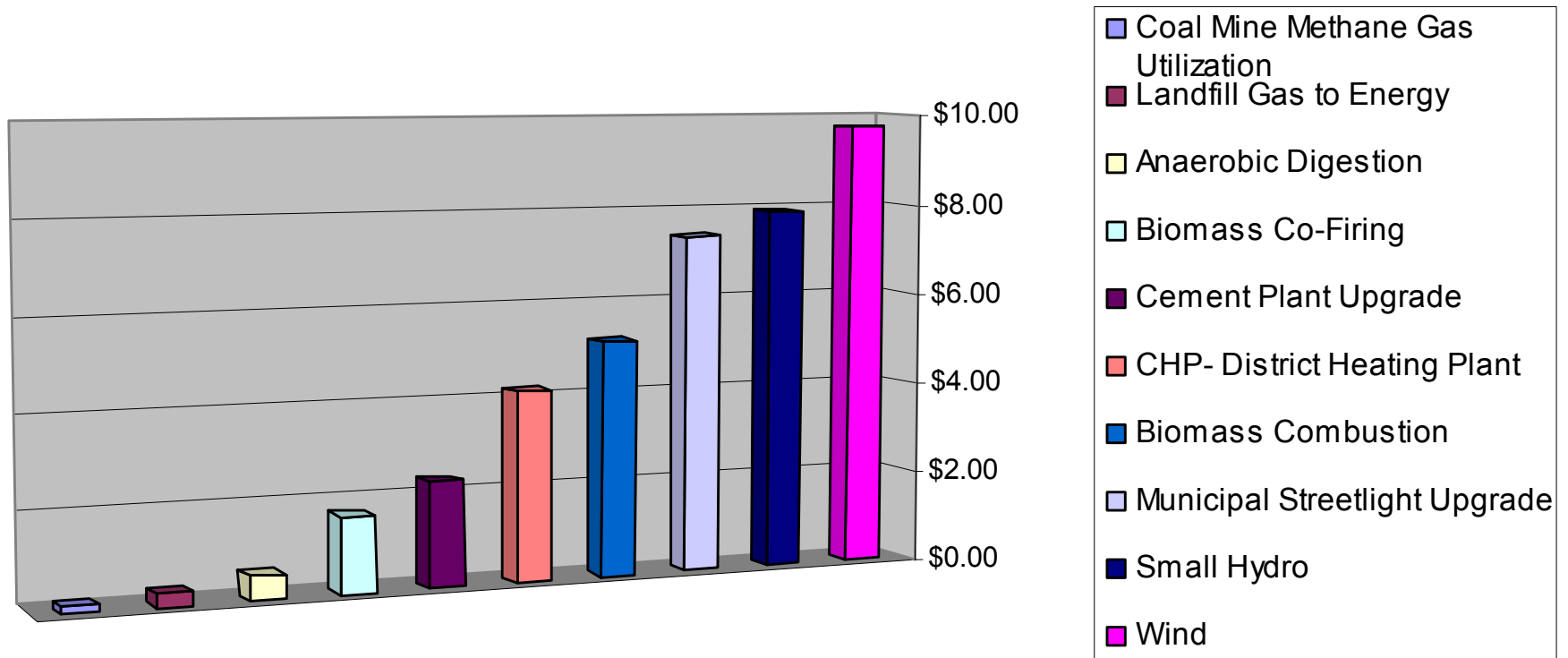
Emissions (per hole or well)		Project Life			
Methane (m ³ /day)	CO ₂ -equiv. (tons/year)	5 years	10 years	15 years	20 years
		PV of Credits (per borehole or gob well)			
2,500	13,000	\$0.2 M	\$0.5 M	\$0.9 M	\$1.4 M
5,000	26,000	\$0.4 M	\$1.0 M	\$1.9 M	\$2.7 M
7,500	39,000	\$0.7 M	\$1.6 M	\$2.8 M	\$4.1 M
10,000	52,000	\$0.9 M	\$2.1 M	\$3.7 M	\$5.5 M
12,500	65,000	\$1.1 M	\$2.6 M	\$4.7 M	\$6.9 M
15,000	78,000	\$1.3 M	\$3.1 M	\$5.6 M	\$8.2 M
17,500	91,000	\$1.5 M	\$3.6 M	\$6.5 M	\$9.6 M
20,000	104,000	\$1.7 M	\$4.1 M	\$7.5 M	\$11.0 M
22,500	117,000	\$2.0 M	\$4.7 M	\$8.4 M	\$12.4 M
25,000	130,000	\$2.2 M	\$5.2 M	\$9.3 M	\$13.7 M
27,500	143,000	\$2.4 M	\$5.7 M	\$10.3 M	\$15.1 M
30,000	156,000	\$2.6 M	\$6.2 M	\$11.2 M	\$16.5 M

Source: TAA CMM Global Market Assessment, 2003©



CO₂ Value for 1% ROR Impact

Effect of CO₂ Revenues On Rate of Return



GHG Contract Structuring the Transaction

Tuscaloosa, Alabama
Neil Cohn, Senior Director

May 7th, 2003



N A T S O U R C E

Terms of a GHG Contract

- Type of Transaction
- Commodity Definition
- Action Taken / Project Description
- Project Qualifications / Certification Status
- Vintage, Volume & Price
- Payment Terms & Delivery
- Ownership Rights
- Warrantees & Representations
- Liabilities, Default & Termination
- Exclusivity & Confidentiality



GHG Market Trading Structures

- Spot / Immediate Settlement
 - Common for allowance & voluntary transactions
- Forward Settlement
 - Contractual Forward as opposed to an exchange traded commodity. This is typical for project based transactions
- Vintage Swaps
 - Not common yet in GHG but has some applications in CDM and allowance markets
- Loans
- Options
 - Calls (the right to buy) have been common but there is minimal market for puts (the right to sell)
- Hybrids
 - Many spot & forward transactions have embedded options



Commodity Definition

- Tradable Units: Metric tons of CO2 equivalent
- Verified Emission Reductions (VERs - non-specific)
 - ✓ ERs occur voluntarily & are surplus to legal requirements
 - ✓ ERs are measured against an appropriate baseline
 - ✓ ERs are verified by an independent third party
 - ✓ ERs have clearly defined ownership
 - ✓ ERs carry some sort of delivery guarantee
 - ✓ Any add'l emissions (leakage) *created* by the project are addressed/mitigated
- Kyoto Units
 - Certified Emission Reductions (CERs – CDM -Kyoto)
 - Assigned Amount Units (AAUs- Sovereign - Kyoto)
 - Emission Reduction Units (ERUs – Joint Implementation - Kyoto)
 - RMU (Removal Units – Domestic Sequestration)
- UK Allowances, DK Allowances, EU Allowances



Action Taken or Project Description

- Technology
 - Coal Mine Methane, LFG, Sequestration, Fuel Switch, Renewable
- Year that action was taken
 - CDM must be from 2000. Many buyers only buy “future” tons. Location
 - Kyoto developing country? (CDM potential)
 - Kyoto developed or Economy in Transition (JI)
 - Non-Kyoto country



Project Qualifications

- Host Government support/approval
- Set Baseline
- M&V, Measure & verify emissions performance against baseline
- Methodology to calculate reduction
- Additionality
 - Environmental, Financial? NGO efforts to “Avoid Free-ridership”
- Sustainable Development (SD) factors
 - Required in CDM. Criteria set by Host Country
 - Projects with high SD factors may have additional value. (Especially in voluntary or retail markets)



Project Certification / Registration Status

- Documentation status
 - Project Identification Note (PIN)
 - Initial document – not official document
 - Project Development Document (PDD)
 - Official CDM document
 - Baseline Document
- Host Government Approval / Support
 - In absence of that a “non-objection” letter
- Kyoto CDM Executive Board Approval?
- Other registries:
 - 1605b or it's successor
 - California Climate Action Registry
 - Climate Leaders
 - Canadian Voluntary Climate Registry (VCR)
 - UK Registry



Ownership Rights

- Justify the sole claim to the emission reductions
 - If several parties are involved this needs to be resolved by contract
 - When multiple claims “divide the baby”
- Settle issues relating to indirect or avoided GHG emission reductions
- Secure permits/credits/allowances from issuing / control authority



Warranties and Liabilities

- Performance / Delivery
 - Warranting that the project will be implemented and generate emission reductions (without warranty of compliance)
 - Recourse could be replacement, financial or other
- Regulatory
 - Validity of that specific project
 - E.g. If the project does not pass certification than the contract is nullified.
 - Or the Seller must replace with valid compliance
 - Or the seller must pay the difference between the market price at that time and the contract price
 - Existence of trading regime
 - E.g. If Kyoto does not ratify than the contract is null & void



Trends of recent CDM deals

- Volumes are way up (Quadrupled from 2001 to 2002) and Project-based transactions dominate (85% of 2002 volume)*
- Less Options and more outright forward streams
 - Call options represented between a third and a half of project-based volume transacted in 1999-2001, but less than 20% of 2002 volume.*
- Forward contracts now dominate and most are based on “payment on delivery” of ERs or valid CERs.
- Combining forward purchase with options for additional volumes and vintages is common
- Very few contracts have an upfront payment negotiated. In the cases that do, sellers repay payment + interest with cash and ERs.

Vintage, Volume, Price & Payment

- Vintage:
 - Year that Emission Reduction was generated
 - Discreet tons per year
 - Crediting for actions for period to be decided by regime (CDM crediting period is 10 years or 3 X 7 years)
- Typically GHG is sold in annual streams
- Price Per discreet ton reduced
 - Specify Currency denomination
- Straight line pricing or escalating pricing
- Payment is typically upon delivery.
- Delivery can be via a registry or via environmental verification docs and contract

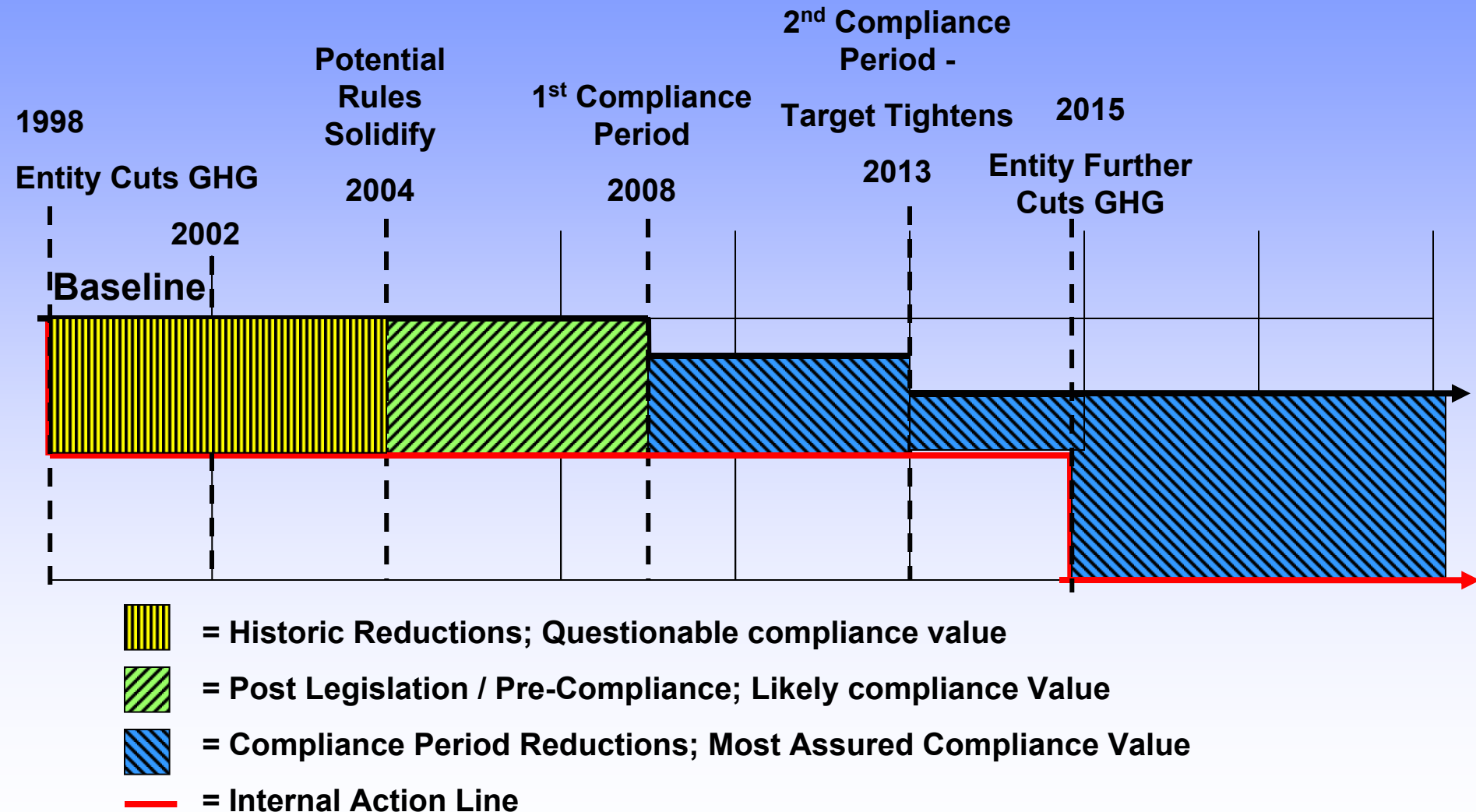


Key Qualitative Price Determinants

- Probability that the GHG ER will qualify for compliance (Certify) under the KP or other regime
- Creditworthiness of project sponsor/Seller and viability of project
- Confidence in the ability quality of the ongoing carbon asset management over life of project
- Structure of contract (e.g. spot vs. forward, upfront vs. payment on delivery)
- Vintage year of generation, year of project installment, year's ER's usable for compliance
- Cost of validation and potential certification
- Additional environmental and social benefits



ER Potential Stream of Value



Details of CDM Candidate Offer

- Quantity and Price offered
- Year that the action was taken (must be 2000+)
- Year that the reduction was generated (Vintage)
- Host country support (incl. Sustainable Development)
- Methodology of reduction
- Baseline details
- Monitoring and Verification Protocol
- Additionality (environmental, technical, investment is optional)
- Seller's credit details and the contract liabilities accepted



GHG Term Sheet



N A T S O U R C E

Proprietary and Confidential

Offer of a Forward Stream of CO2 Equivalent (CO2) Emission Reductions

Price:

Vintage	Volume Mt		Price per metric ton CO2E Emission Reduction (US\$)			
2003	210,000	@	1.10	In	2003	Dollars
2004	210,000	@	1.20	In	2004	Dollars
2005	210,000	@	1.30	In	2005	Dollars

1. Payment and Delivery
2. Action Taken
3. Criteria for establishing CO2E Emission Reductions
4. Sale conditions
5. Seller Description
6. Commission
7. Confidentiality

Brokers Role in

Creating the Transaction

- Assess needs & rationales of Buyers and Sellers
 - Buyers & Sellers are often trading different commodity (i.e. financing vs. compliance)
 - Define appropriate commodity to meet these needs
 - Product, Location, Methodology, Verification, Vintage
- Clarify optionality each party requires or is able to yield in order to maximize benefits for both parties
 - Financial, Payment, Timing, Security, Contracts
- Identify Risks and assign each to party most suited
 - Certification risk, Project Failure, Credit Risk, Political risk (Domestic – International), Insurance costs



N A T S O U R C E

Greenhouse Gas

Natsource LLC

Emissions
Management
Group

Natsource

(Every climate organization needs an acronym)

A Catalyst to Market Transactions

- Climate
- Asset
- Sales
- Help



N A T S O U R C E

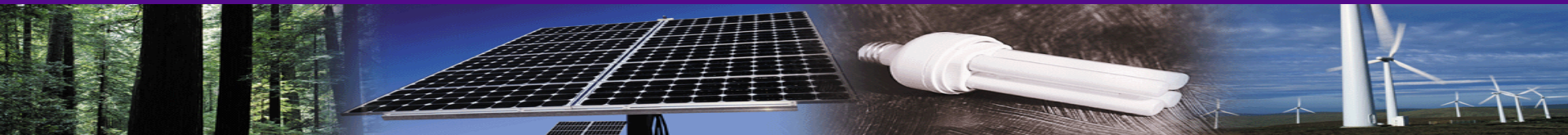
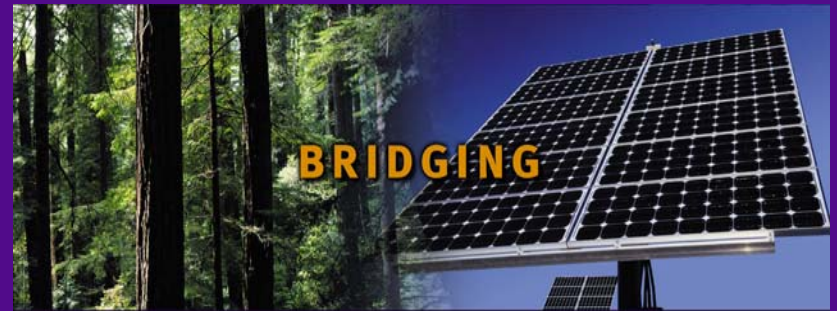
Greenhouse Gas

A CMM Case Study

2003 International Coalbed
Methane Symposium
May 7-8, 2003

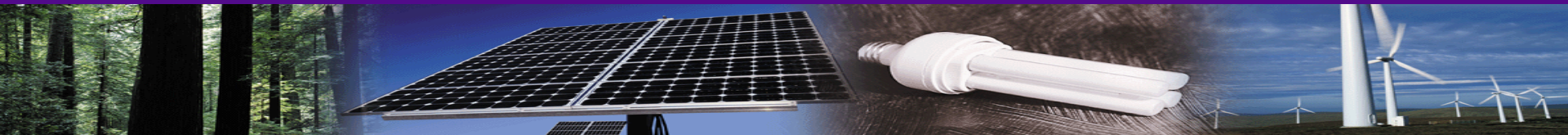
Dr. Mark C. Trexler

©Trexler and Associates, Inc., 2003



Choosing a Case Study

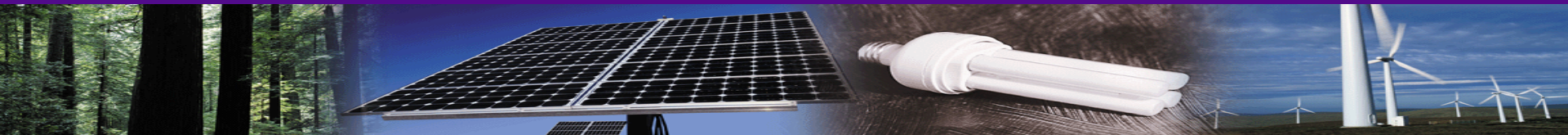
- ✓ Number of Actual CMM Transactions Limited
- ✓ Domestic and International Transactions Likely to be Very Different in Today's Market
- ✓ Will Focus This Discussion Solely on a “Composite” Domestic Project
 - Draws on several actual projects around the U.S.
- ✓ Much of The Case Study Applies to Other CMM Projects, in Other Regions



CMM Technologies Compared

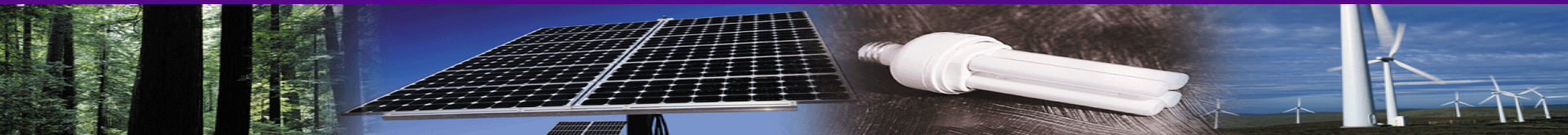
	Opportunity for Competitive Advantage														
	General Acceptability to Mine Owners, Others														
	Likely Overall Cost-Effectiveness														
	Dependence on Other Policy/Market Forces														
	Overall Additionality														
	Ease of Baseline Development														
	Technology Availability														
	Capital Cost of Pursuing Resource														
	Ability to Exploit Small Scale Resources														
	Potential for Economic Return														
	Level of Expertise/Infrastructure Required														
	General Information Availability														
	Overall Magnitude of Resource														
	Ancillary Benefits														
	Summary														
Post-Mining - Collect and Flare	Good	Fair	Excellent	Excellent	Excellent	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Mining - Flaring Already Collected	Good	Fair	Excellent	Excellent	Excellent	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Degasification - Collect and Sell	Fair	Excellent	Good	Good	Good	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Degasification - Flaring Already Collected	Fair	Fair	Fair	Fair	Fair	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Post-Mining - Collect and Sell	Excellent	Fair	Fair	Fair	Fair	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Degasification - Collect and Flare	Fair	Fair	Fair	Fair	Fair	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Mining - Collect and Flare	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Mining - Collect and Sell	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Excellent	Poor	Excellent	Fair	Good	Poor	Good
Mining - Ventilation Air	Good	Poor	Poor	Excellent	Excellent	Excellent	Poor	Poor	Poor	Poor	Poor	Poor	Excellent	Poor	Fair

Source: TAA CMM Global Market Assessment, 2003©



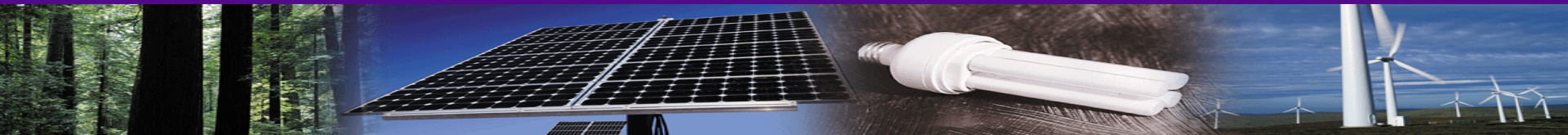
Key “Buyer” Case Study Variables

- ✓ Cost Effectiveness (against price curve, other options)
- ✓ Financial Structure (up-front vs. pay as you go)
- ✓ “Creditability” (including ownership, govt. approvals)
- ✓ “Additionality” of Funding and Carbon Benefits
- ✓ Guarantees of Delivery of Reductions
- ✓ Quantifiability of Benefits, Uncertainties
- ✓ Co-Benefits, Sustainable Development, Perspective of Environmental Players
- ✓ Transaction Costs (documentation, contracting, M&V)



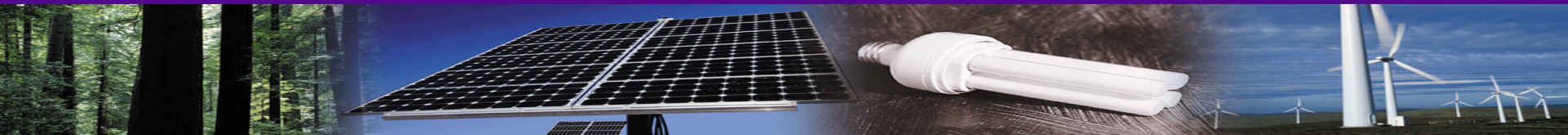
Key Seller Case Study Variables

- ✓ Value of Selling the Credits
 - Does the funding provide a material benefit?
 - Does the funding justify transaction costs, including development, negotiations, legal work, ongoing costs?
- ✓ Financial Structure
 - Does it cover upfront funding needs?
 - What to offer at what price, and for how long?
- ✓ The Magnitude and Distribution of Risk
 - Project and credit guarantees?
 - What's my downside?
 - Is there upside, and who gets it?



Case Study (Composite) Project

- ✓ **Location:** Midwest and Eastern United States
- ✓ **Project Type and Status:** Sealed coal mine methane capture; ongoing
- ✓ **General Project Description:** This project captures methane currently being vented from sealed coal mines. It employs a customized technology to cost-effectively generate electricity at small scale, and a demonstration technology to clean up vented gas to the point of being able to sell it to natural gas pipelines.
- ✓ **Source of CO₂ Benefits:** The project captures methane that would otherwise be vented to the atmosphere, and results in its combustion and/or utilization. As such the project is able to leverage the Global Warming Potential of methane. The project also displaces electricity from a primarily coal-fired grid, and these benefits can be quantified.
- ✓ **Projected CO₂ Benefits (tons CO₂):** More than 100,000 tons CO₂ per year
- ✓ **Buyers:** U.S. and Canadian utilities (voluntary and compliance markets); CO₂-Neutral companies (voluntary market)

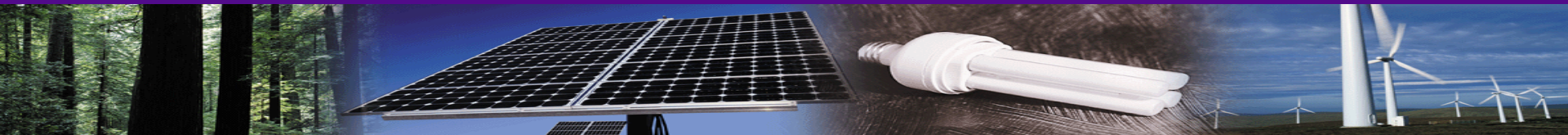


Composite Project Economics

Parameter	Assumption	Unit
CMM Capture Rate	250,000	m ³ /day
CH ₄ Concentration	90%	percent
CH ₄ Recovery Rate	93%	percent
Operations	340	Days/year
Gas Decline Rate	2%	percent/year
Capital Cost	\$16,000,000	\$
Operating Costs	\$0.105	\$/m ³
Project Life	10	years
Gas Price	\$0.148	\$/m ³
CO ₂ Baseline	0.0142	tCO ₂ /m ³ of CH ₄
Hurdle Rate	15%	percent

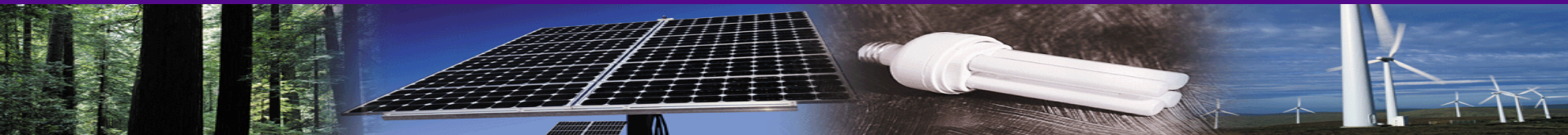
Output Measure	Result	Unit
NPV 15%	(\$2,383,911)	-
IRR w/o CO ₂	10.55%	-
CO ₂ Offsets	9,270,993	tons
Levelized CO ₂ Cost	\$0.52	\$/tCO ₂

- A CO₂ price of only \$0.11/ton is required to raise the project IRR by 1%.



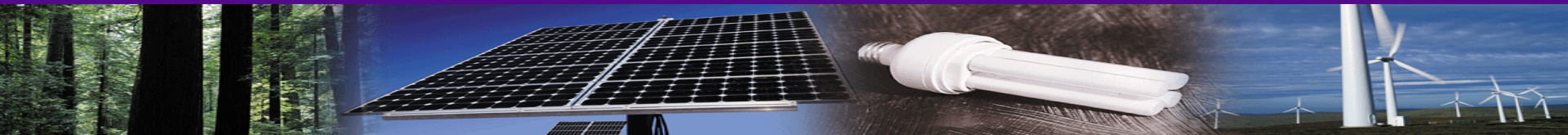
Satisfying the Buyers

- ✓ **Cost Effectiveness (against price curve, other options):** Very competitive with other high quality projects, with “simple” willingness to pay varying from \$1 to \$4.
- ✓ **Financial Structure:** All projects involve up-front funding to help get over limitations of capital in pursuing the projects. To mitigate associated risk, one buyer able to negotiate “simple payback” of investment over time. To mitigate associated risk, one buyer able to negotiate “options” on more future projects at similar favorable terms. Note that more and more purchasers looking for “pay as you go,” and potentially willing to pay the additional carrying costs (and foregone benefits) of this approach.
- ✓ **Clarity of Reductions Ownership:** Ownership a major issue in project negotiations for compliance buyers, but not for voluntary buyers. Sellers able to demonstrate ownership of both gas and mineral leases. Risk judged acceptable by compliance market buyers. Purchasers with less project development experience (e.g. munis) much more concerned about ownership, proposing a quit claim approach. Such an approach has not proven acceptable to sellers.
- ✓ **Creditability:** Buyers confident future credits will ultimately count for domestic compliance purposes, and hopefully for international compliance purposes.



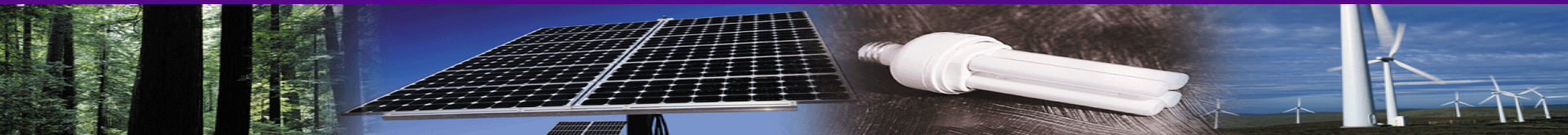
Satisfying the Buyers

- ✓ ***Additionality of Funding and Carbon Benefits:*** Small scale CMM projects, particularly from inactive mines, have had no trouble demonstrating additionality. The financial returns of such projects are clearly insufficient to make them happen in a “business as usual” scenario. Have proven “easy to sell” in both compliance and voluntary frameworks.
- ✓ ***Guarantees of Delivery of Reductions:*** Guarantees becoming increasingly important for compliance market, although a clear correlation between risk and price. Guarantees have not covered “creditability” of reductions, or ownership of reductions. Have covered delivery of basic CMM tons, and associated reductions. Voluntary market has not required guarantees, since volumes are so low that probably not a major issue.
- ✓ ***Quantifiability of Benefits, Uncertainties:*** Not a key issue for buyers if delivery guarantees are present. Without such guarantees, would be a major issue even in a “pay as you go” financial structure.
- ✓ ***Co-Benefits, Sustainable Development, Perspective of Environmental Players:*** For voluntary market purposes, U.S. location helpful. In one case used as a voluntary environmental initiative in building a new power peaking unit in the state. Environmental stakeholders willing to bless project as real, measurable, verifiable after careful review.
- ✓ ***Incremental Transaction Costs (including M&V):*** Considered not out of line with other project opportunities.

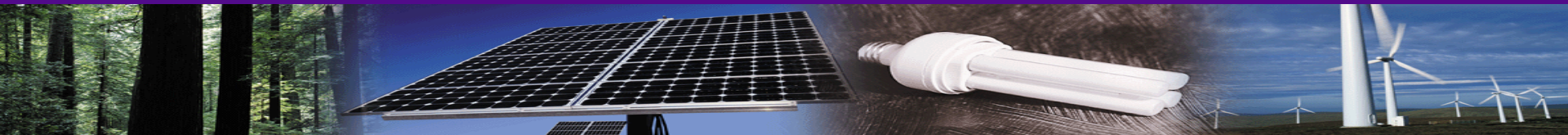
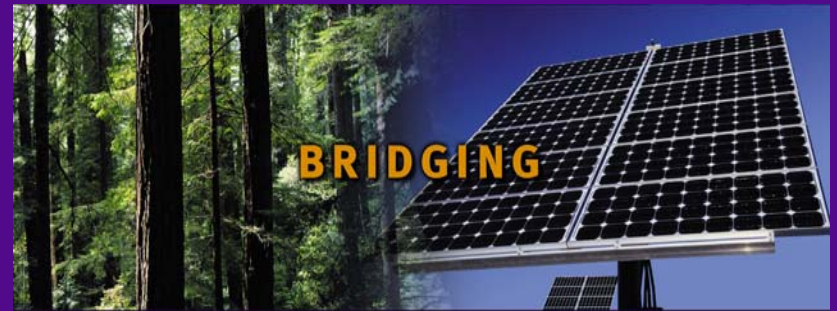


Satisfying the Seller

- ✓ ***Does the funding provide a material benefit?:*** For small scale CMM development, even limited up-front funding can materially benefit the project.
- ✓ ***Does the funding justify transaction costs, including development, negotiations, legal work, ongoing GHG-specific costs?*** Small scale project developers have been willing to absorb transaction costs that are probably disproportionate to the financial returns. However, does provide up-front learning and positioning in the market.
- ✓ ***Does it provide my upfront funding needs?*** Has been possible to get funding primarily in form of up-front payments, although buyer willingness to “pay as you go” is growing, notwithstanding additional concerns this can raises.
- ✓ ***What to offer at what price, and for how long?*** Sale of “early” tons at low cost has made sense, since opportunity value quite limited. Sellers desire to maintain as much flexibility as possible to collect additional financial gains for future tons, or for project “upside.”
- ✓ ***Project and credit guarantees?*** Have had to put up other projects as collateral, but basic delivery guarantees considered reasonable.
- ✓ ***What's my risk, Is there upside, and who gets it?*** With guarantees risk is potentially significant. In today's market, majority of upside may have to be given up. But opportunity to realize near-term cash flow from this commodity has been considered worth the risk.

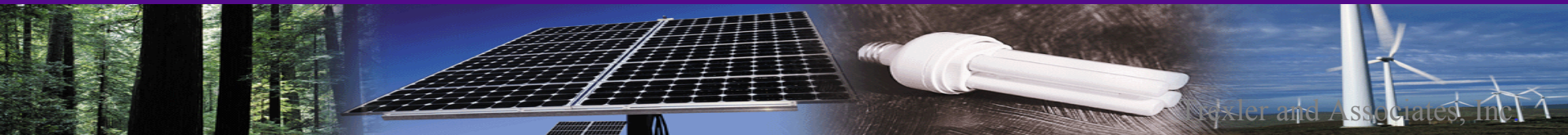


TAA's Role in the Process



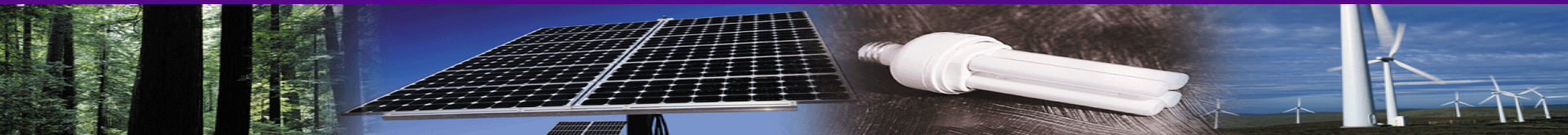
Who is Trexler and Associates, Inc?

- ✓ Doing Climate Change Mitigation Since 1988
- ✓ Works With Private Sector Companies Looking to Address Climate Change Risks and Opportunities
- ✓ Works With Project Developers Seeking to Access Carbon Funding
- ✓ TAA Has Generated More than \$10 Million in Carbon Funding for Projects
- ✓ TAA Has Generated Several Million Dollars for CMM Projects Specifically



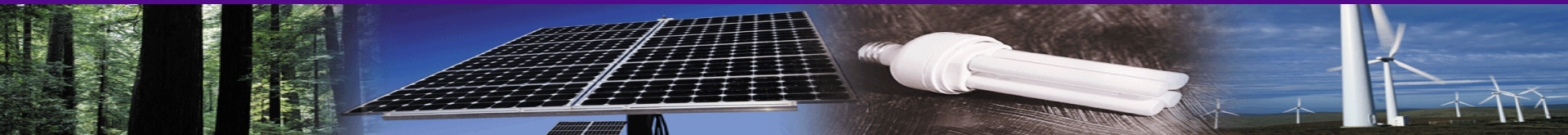
Enhancing Project Value

- ✓ TAA Not a Project Broker
- ✓ TAA's Project Development Work Focuses On Enhancing a Project's Value
 - Evaluating and mitigating risks of project failure
 - ✓ Ensuring comprehensive project design
 - ✓ Ensuring high quality project partners
 - Ensuring environmental credibility
 - ✓ Baselines, additionality, monitoring and verification, etc.
 - ✓ Sector specific issues: e.g. additionality concerns
 - ✓ Good contracting, clear ownership
- ✓ Our Clients Trust The Projects We Bring to Them



Working With Project Developers

- ✓ Keeping Them Informed of the Market
- ✓ Assessing Baselines, Quality of Reductions
- ✓ Assessing Marketability of Offsets
- ✓ Preparing Offset Documentation, RFP Responses
- ✓ Marketing of Offsets
- ✓ Bringing Buyers to the Table



For More Information

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